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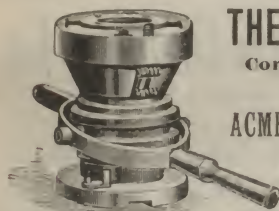
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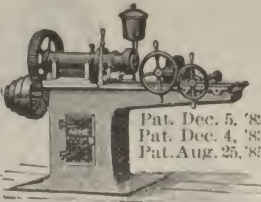
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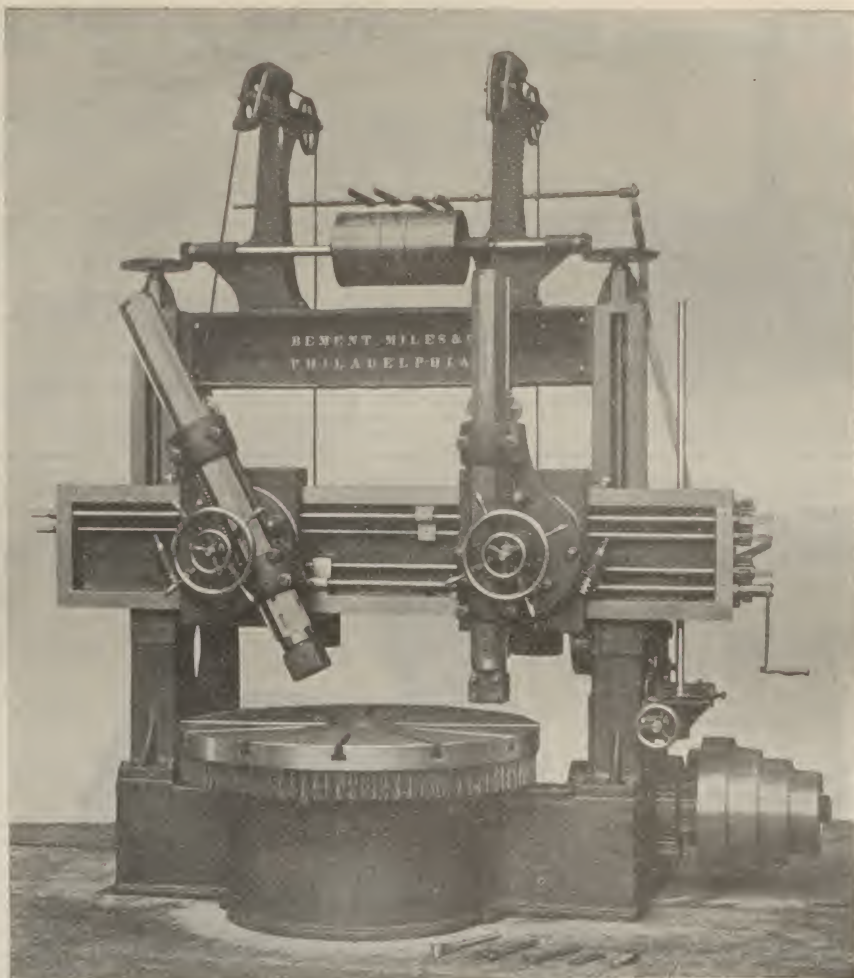
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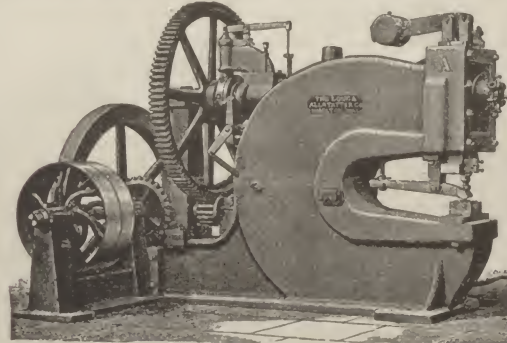
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# THE RAILWAY REVIEW

XXXVI.

FEBRUARY 22, 1896.

No. 8.

**TRANSPORTATION OF TREASURE IN CHINA.**—The provinces of China, in transporting their dues to Peking, use the simplest means, without the protection of a single soldier. It is an impressive sight, says Prof. Cady in the Century, to meet a line of pack mules, horses or camels loaded with silver bullion. The silver is usually confined in rough logs of wood that have been split, hollowed out and then bound together, and each load is marked with a little flag of imperial yellow, stating the amount and destination. That is all the protection there is except the ordinary drivers, who carry no weapons, and are attended by no guard. In what other land on the face of the globe could this be done?

**RAILROAD EMPLOYEES READING ROOMS.**—The Railway Men's reading room at Sayre, Pa., was opened February 4 with appropriate exercises. This room, with its equipment, was tendered by Mr. O. O. Esser, superintendent of the Pennsylvania & New York division of the Lehigh Valley R. R., for the free use of the employees of the railway and the citizens during the year 1896. There are nearly 2,000 employees of the Lehigh Valley Railroad located at Sayre, and they have heretofore been without the advantages of a resort of this kind, and those present received the gift with enthusiasm and made a fitting acknowledgement to the superintendent. The room is on the second floor of the passenger station, convenient of access, is well furnished, heated by steam and lighted by electricity, and will seat about 150 people. A large number of periodicals have already been presented by friends of the project; the list of railway and engineering publications being particularly complete. A library in connection with the reading room has been started in the room adjoining, and a good beginning has already been made towards a supply of books. It is the intention to have a series of practical talks in the reading room on topics of interest to railway men, and such other exercises for instruction and entertainment as can be arranged for. The advantages of such accommodation have been very generally recognized by railway companies, and the enthusiastic opening in this case promises well for the success of this praiseworthy undertaking. This example, observes Engineering News, might well be followed by railways generally where the number of men assembled is sufficient to warrant such a movement, and where the railway branch of the Young Men's Christian Association has not yet established quarters on the same plan.

**OBTAINING FRESH WATER AT SEA.**—Alexander Graham Bell's latest mechanical device is in the line of practical utility, like most of his inventions. It is intended for the fisherman who are frequently cut off from their vessels by fog, and lose their lives as frequently by lack of drinking water as by exposure. The invention consists of a glass cylinder or bottle, through the neck of which is a small rubber tube. The glass is submerged, and a brass cylinder, acting as a bellows through the rise and fall of the waves, pumps the atmosphere into the submerged bottle. There it becomes condensed, and a supply of fresh drinking water is always to be obtained.

**QUALITY OF AMERICAN TOOLS.**—A leading iron journal of England frankly makes the statement that American files, saws and in fact most mechanics' tools are in high favor with British retailers. Further, it seems that the precedence given United States wares of this class is due to the superiority of the goods themselves. A correspondent takes this view in the publication in question and in epitomizing the situation adds that the better business methods pursued by American manufacturers constitute a formidable element. He claims that the Sheffield houses take from four to eight weeks to fill an order, while a requisition on an American agent in London is honored in as many days; that the existing descriptions accompanying our saws are full and intelligible, while the English manufacturer furnishes a vague and imperfect schedule; that the prejudice against machine cut files is dying out, and those sent from here are lighter, cut better and last longer than those English made; that our six horse rasps are very popular with smiths. Summing up, the experienced correspondent states that quite 90 per cent of the files he now sells are American made, and that his customers prefer them to any other brand.

**MAGNITUDE OF THE COKE.**—From figures just compiled by Sam F. Hood, joint car agent, in the Connellsville regions, we note that the Connellsville coke region now contains a total of 17,947 ovens; of this number 11,699 ovens are operated by the H. C. Frick Coke Co. interests, 1,501 by W. J. Rainey, 1,793 by furnace interests, 772 by the Hecla Coke Co., 745 by the Jas. Cochran estate and others, 607 by the Hostetter Connellsville Coke Company and others, and 830 by various small operators. It also appears that these ovens produced during the year 8,244,438 tons of coke the average price of which was \$1.20 per ton, making the aggregate value of the output \$9,893,325. To handle this output a total of 441,243 cars, or an average of 1,417 cars daily were required. These figures show an increase in the coke tonnage from this district over 1894, of 2,789,987 tons, and over 1893 of 3,438,815 tons, which is no doubt a pleasing condition both to the coke manufacturer and to the transportation companies.

**WHERE MICA IS MINED.**—The enormous expansion of electrical science has produced a corresponding output in mica. Of the world's supply of mica North Carolina, U. S. A., produced about 100,000 lbs. per year; New Hampshire, U. S. A., a trifle over 25,000 lbs.; South Dakota, 18,000 lbs.; New Mexico, 1,000 lbs. The North Carolina product commands the highest price in the market. There are few more beautiful sights than a mica mine in South Dakota. When the mine is lighted by a torch it is a veritable palace of Alladin, the mica flakes reflecting innumerable points of light in every direction, which with the creamy white of the containing walls, transform the gloomy tunnel to a hall of dazzling brilliancy. It is held in what are technically known as books, ranging in size from the tiniest prayer book to a huge dictionary. These are contained in huge veins of albite, a white crystalline rock of a creamy soft whiteness. The books as they come out, some of them larger than the largest dictionary, are easily split into leaves. One of the largest pieces of mica known came from the South Dakota mines in the Black Hills. It was a quarter of an inch thick, so clear that a newspaper could easily be read through it, and measured about 44 inches square. The two principal uses of mica are in stoves and as insulators in electricity. It has what is termed an "infinite resistance." It is flexible, nearly or quite transparent, and capable of being divided into leaves, so fine and delicate that it will cast iridescent reflections which approximate the thinness of a soap bubble. Few natural products are carried on with such wasteful expenditure of material as mica. For the lucky individual who will discover a means of utilizing the enormous waste a fortune awaits. It has no superior as a non-conductor of heat. If a practical method of boiler covering were devised from mica it would leave nothing to be desired.—[Electrical Journal.]

**ILLUMINATING POWER OF PINTSCH GAS.**—An interesting exhibition of the Pintsch system of lighting may be seen at its office, No. 160 Broadway, New York, where is illustrated the difference in illuminating power of the following gases: Ordinary city gas, uncompressed; the same compressed, and also the Pintsch gas compressed. In a lamp such as is seen in the Broadway and Third Avenue cable cars the Pintsch gas shows a flame of at least six times the illuminating power of the ordinary commercial compressed gas. In an inverted Argand lamp, where more gas can be consumed than by the burners above referred to, it was necessary to use eleven to thirteen feet per hour of commercial gas compressed in order to approximate in brilliancy one-fourth of the amount in Pintsch gas. The exhibition is attracting much attention from persons interested in railway and street lighting.

**TRAFFIC VIA THE SUEZ CANAL.**—Last year the Suez Canal Company's receipts were larger than ever before, though the number of ships passing through the canal was eighteen less than during the preceding year. The increase in receipts is explained by the special traffic caused by the China-Japanese war and the Madagascar and Abyssinian campaigns. Great Britain was the principal user of the waterway, but United States Consul General Penfield's report upon the subject to the state department says it is significant that she had sixty-four fewer vessels than in the preceding year, while Germany, making a determined fight for oriental trade, had eighteen more, and the increase of ninety vessels in the French traffic cannot be explained by wars. Of 3,434 steamers passing through the canal, only four carried the United States flag.

**A SORT OF PERPETUAL MOTION RAILROAD.**—A very unique road is being considered by the Marquette Iron Range Railroad Company of Michigan, for transporting ores. It is in length 15 miles, in which there is a fall of about 800 feet from the mines to Lake Superior. On account of the topography an endless chain cable is impracticable, and it is therefore proposed to construct an ordinary trolley line without a power house. The loaded trains come down from the mines generating current, which is to be transmitted to the trolley line, and from it to the cars going up grade. The loaded cars weigh 25 tons, and each train of 10 or 15 cars will have a motor car; the difference in weight between the light and loaded trains is thought to suffice to overcome the loss of power in the transmission and machinery.

**NO LONGER THE RAILROAD MAN'S "BEST FRIEND."**—A brakeman on the Erie Railroad caught a spark on the back of his celluloid collar as his train entered the station at Hillsdale, N. J., January 2. The collar took fire and, although the man seized the collar with both hands and tore it from his neck, he was burned severely on the face neck and hands. He was taken to a drug store, where his wounds were dressed, and later was taken to his home in New York. He will be disabled for some time.

**TURNING CHILLED ROLLS.**—Those who have essayed turning chilled roll for the first time have not been pleased with the experiment, nor usually satisfied with their success. It is an art in itself; an art which perhaps the late Morton Poole of Wilmington, Del., did more than any other one man to bring to perfection—and to perfection he certainly brought the grinding of chilled calendar rolls for paper making. Before, however, the grinding operation is commenced, there must be as nearly perfect work done by the lathe as it is possible for such an imperfect machine tool as a lathe to perform; but most tools for this work have the double disadvantage that they do not do good work and do not work fast enough. But by the use of a simple tool the work is rendered very easy, and its quality—for lathe work—leaves nothing to complain of. A plain bar of tool steel is taken, about 1 1/4 in. square; about four inches of it is cut off, and then fluted on each side with a semi-circular channel of about 3/8 in. radius. All four sides of the bar being then ground so that the four angles are exactly 90 deg. each, the tool is ready to be clamped in the tool holder and set to work. It does not remove curls of material, but takes off a series of brittle, thread-like turnings, about the size and general shape of pine needles. When one band four inches wide is turned, the tool is moved along.—[“G” in American Machinist.]

**ELECTRO MAGNETS AS LIFTING AGENTS.**—Electro magnets as lifting agents in connection with cranes came into use several years ago, though on the whole, their employment in this way has been comparatively restricted. In one of the large English foundries—at Sandycroft—however, they are now again applied to that purpose, and in sizes which permit of readily lifting by their means weights of as much as two tons. The magnets are attached to a crane, and take a current of about 5 1/2 amperes at 110 volts, the current supply being controlled by a switch. Some measure of the service gained from these magnets

may be obtained from the statement that with one of them three men can do in about 15 minutes the work which previously occupied twice as many men for about an hour and a half.—Cassier's Magazine.

**LAKE LEVELS.**—General Craighill, chief of engineers of the war department, is a broad man and a true friend to the commerce of the great lakes. He has sent to the house committee on rivers and harbors a strong expression in favor of investigation of the falling levels of the great lakes. This is contained in his report on the Griswold bill, practically the same as the bill introduced by Senator Brice and published recently. In his communication General Craighill says that the question is the most important and momentous that now arises for the consideration of congress and the department in connection with navigation interests. He suggests the possibility of checking the subsidence of the waters of the lakes by the construction of wing dams in the St. Clair and Detroit rivers in order to hold the waters in the upper lakes, and also to place similar dams at the entrance of the Niagara river to raise the waters of Lake Erie. It has been shown to the satisfaction of the sub committee of the committee on rivers and harbors, which made the report recently published in favor of the Griswold bill, that a raising of the levels of the lakes three feet would make a difference of 30 per cent in the possible increase in carriage by the vessels of the lakes, and that the cost of the proposed wing dams would be much less than the cost of dredging in the harbors where navigation has been impaired.

**JAPANESE IRON.**—A sample of Japanese pig iron was recently shown in Middlesborough, England, which excited considerable interest among ironmasters. It was made from native ore and coke at the only furnaces which exist in Japan. The cost is stated to be about \$9 per ton delivered in London, but little was paid for freight, because it came principally as ballast. It is of good quality, a sample locally analyzed giving silicon, 3.26 per cent, as against 2.8 per cent in a representative Cleveland pig; sulphur, 0.38, against 0.04; and phosphorus, 0.81, against 1.46; and manganese, 1.44, against 0.52. A good deal of Cleveland iron is sent to Japan every year.

**LIQUID FUEL FOR GERMAN WARSHIPS.**—Experiments have been conducted on board the Carola, Siegfried and some torpedo boats with a combustible which has given excellent results, says an exchange. The small armored ships Odin and Aegir are being fitted with the necessary apparatus, which we believe will also be installed in the battleship Ersatz Preussen, now under construction. The new combustible is called Masut in Germany, that being the name of its Russian inventor. It consists of certain hydrates of carbon, which give a high caloric power to the liquid. The chief element is a distilled product of Russian petroleum mixed with other oils, and, inasmuch as the ignition point is high, the fuel may be dealt with and stored without danger. The heating power is taken to be about one-third more than that of the best coal. The specific gravity is also less than that of coal, so that, if reports are true, the fuel possesses decided advantages. It can be stored in tanks or in the double bottom of the ship, and be conducted through pipes to the stokehold. There is, however, one danger. If through the action of a shell or other cause, the oil should find its way to the stokehold a terrible explosion might ensue. We have not seen any statement as to how the oil is to be applied, but under the system of Signor Cuniberti, liquid fuel is applied in the form of spray, not to replace coal, but to add vastly to the heating power.

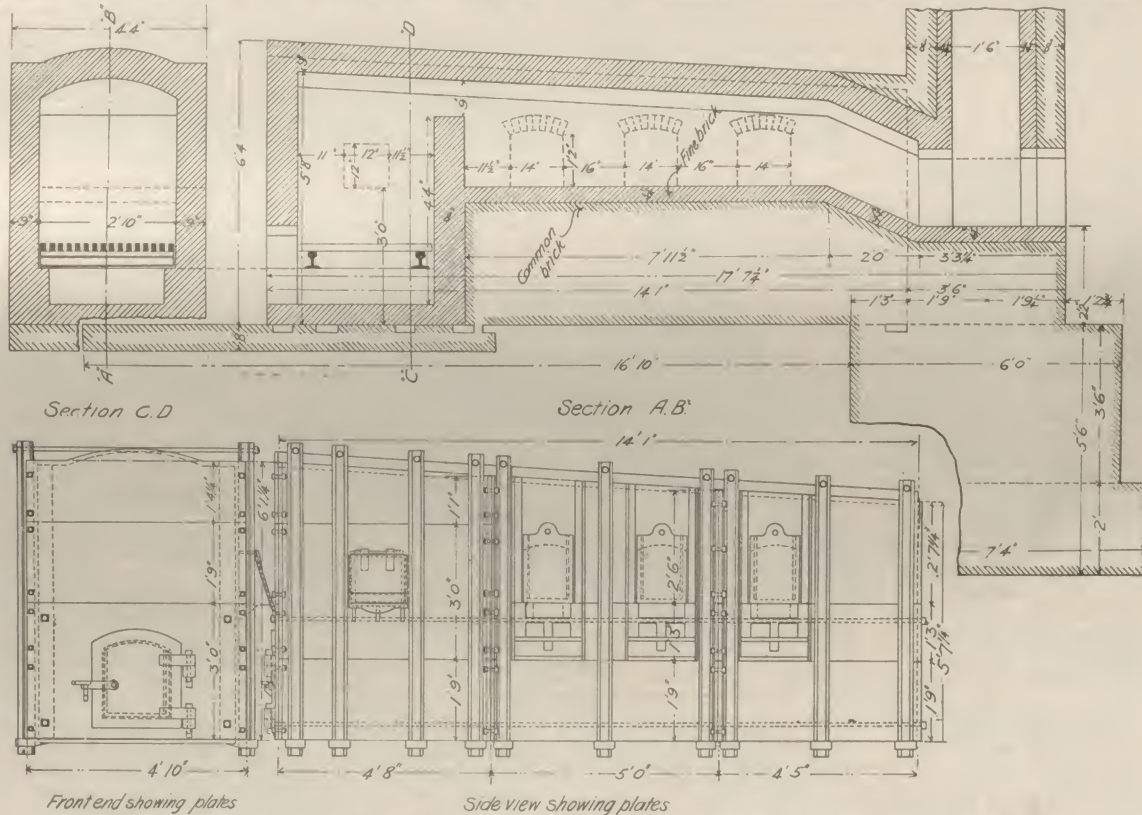
**PROTECTION OF WATER GAGE GLASSES.**—Mr. F. W. Webb, of the London, & North-Western Railway works, Crewe, in a letter to the Engineer, describes a method he has adopted on the locomotives of this railway for the purpose of minimizing the danger accruing from the bursting of a glass water gage. These, with the high pressures now in vogue, are apt to give rise to serious consequences to the attendant from the flying fragments of broken glass, and several cases have happened in which the eyesight has been irretrievably destroyed. With a view to prevent these occurrences, guards, made of toughened glass, are now commonly fixed, so as to keep the fragments within a limited range. These are sometimes made of two inclined plates fixed in a brass frame, or with a flat plate in front. In others the guards is made of horseshoe shape, in sections, and has a wire network cast in the heart of the glass. Instead of these glass guards Mr. Webb proposes the encircling of the glass tube in a spiral wire spring. The spring forms a good support or backing to the glass, and when breakage occurs holds the pieces together and prevents them scattering. It is also said that the spring maintains the glass at a more uniform temperature. In the event of fracture the glass is easily removed by slightly compressing the wire spring, which can then be removed from the recesses in which it fits at the ends. Mr. Webb also refers to another little improvement in the packing for the glass, and which consists of a conical brass shield, now commonly used for high pressure gage glasses. The ring is flanged on the outside so as to rest on the top of the gage glass fitting, and prevents the India rubber getting out of shape. This, Mr. Webb states, results in the conical packings lasting much longer, and also gets rid of a good deal of trouble which was previously experienced with the India rubber rings before they were protected.

**STRENGTHENING IRON PIPES.**—The plan of winding steam pipes over eight inches in diameter with three-sixteenths inch wire copper, thus nearly doubling the bursting pressure, is pronounced by competent judges to be an important change in engineering practice. Further, that the thickness of sheet copper forming the pipe may be reduced to the minimum, and at the same time insuring the full advantage of wire winding, an improved system of manufacturing steam pipes has been devised, described as consisting in simply using copper of the thinnest possible gage to form the interior or core of the pipe, while the body proper is composed of steel wire wound closely around the core, the interstices being filled in solid with copper by electro-deposition. Increased strength comes from wire winding.



## FURNACE FOR ROD MILL—CHICAGO, MILWAUKEE &amp; ST. PAUL RAILWAY.

In the RAILWAY REVIEW of January 18, page 34, a description is given of the new rod mill for scrap material which is in use at the West Milwaukee shops of the Chicago, Milwaukee & St. Paul Railway. In the general view which was presented with this description the furnace may be seen in the background, and herewith an illustration is presented showing its dimensions and the manner in which it is constructed. The hearth is 3 ft. wide, and nearly 8 ft. long, having three serving doors. The hearth itself is composed of fire-bricks placed upon a filling of common brick. The bridge wall is 8 in. thick and leaves an opening at the crown of the furnace 9 in. in width.



ROD MILL FURNACE—CHICAGO, MILWAUKEE &amp; ST. PAUL RAILWAY.

The brickwork is entirely enclosed in plates which are bolted and tied at the top and bottom of the furnace, as shown in the illustration. The total length of the furnace proper is 14 ft. 1 in. The height is 6 ft. 4 in. and the depth outside 4 ft. 10 in.

## A RAILWAY BRIDGE AND BUILDING DEPARTMENT.

ONWARD BATES, M. AM. SOC. C. E., M. INST. C. E.

(Continued from page 88.)

There should be complete understanding between the employees of the department and the division superintendent with regard to the authorization of and the methods of ordering and doing work of the second class. There are certain minor repairs, the authority for which may be by special appointment delegated to the employees of the department, such as the keeping of station platforms in a safe condition and light current repairs to buildings, stock-yards, etc.. The division superintendent should have authority to order such work as is necessary for the maintenance of the water supply, and on each division there should be some employee of the bridge and building department in direct charge of the water supply, who is in constant telegraphic communication with the train despatcher, and receives orders from him direct when there is a scarcity of water at any station. Authority for extensions of water supply and improvements in the same should originate with the division superintendent, and it should be the duty of the bridge and building department to recommend to him such extensions and improvements. The reason for this is that the division superintendents controlling the use of the machine may alter the train service or make changes in the general service, which would upset any scheme of the bridge and building department, no matter how well conceived. The division superintendent must depend upon this department to furnish him with estimates of cost and opinions as to the practicability of propositions for improvements, and the department should uphold its claim of being the source of technical information by furnishing complete expert information promptly on demand.

Having explained the proper sources of authority for the work of the department, it is unnecessary to go into detail as to the precise method of ordering this work because that will vary on different railways with the relative extent of organization and division of duties among its many employees, and it is not my province in this paper to explain the duties of employees outside of the department. I also indicate only in general terms the duties of those employees within the department, because the internal organization will vary with the amount of work, which in turn generally varies with the length of the com-

pany's railway. There should be enough men in the department at all times to respond to emergency calls, as no railway operates without unusual occurrences which require the prompt attention of expert employees. The work of the department should be distributed throughout the year with the view of keeping this minimum number of employees in the service. The extra cost of keeping them through the short days of winter when work cannot be done to such good advantage as in summer, is more than repaid to the company in having at hand a force of competent workmen who are familiar with the operation of the railway. It is the fashion for railway lines to be combined into large systems, and in such cases the organization of the department becomes comparatively extensive, that on any one division correspond-

disinterested attention to the work that an employee of the railway will. The objections to contract work are particularly strong in that which is of such a character that the work may be covered up. There is enough bad contract masonry on our railways to condemn the practice of building it by contract. What applies to masonry, applies with still greater force to foundations, and sub-structures cannot be to closely watched when built by contract.

All contract work should be built under complete specifications, and with the closest inspection by expert inspectors, and this inspection should have the check of observation by as many employees as is practicable. As an example, it is a good plan in buying iron or steel bridge work to buy it unpainted. A coat of linseed oil at the shops will protect it until it is erected, and being transparent there is opportunity for the company's employees to discover any defects in the material which have been overlooked by the shop inspector, before the work is painted and goes into service as a complete structure. Even with the very best of intentions on the part of the contractor he is to be protected against his own employees who may foolishly imagine they are doing him a service by imposing bad work upon the company, or may think to make a record for themselves by doing a large amount of work at the expense of its quality, and the custom of inspection has become so universal that it carries with it no implication of business dishonesty. As a rule those contractors who do the best work desire the presence of the company's inspector. It is not to be supposed that no inspection is required for work which is done by the company's employees. While there is less inducement on the part of the employee to do bad work, it is necessary to protect the company against his carelessness, and perhaps incompetency, by inspection and supervision. The criticism which is most applicable to the work of this department, performed by its employees, is that it shows the lack of supervision and inspection.

The head of a department should be competent to design all of the ordinary structures which he has to build. On some large railway systems the department makes its own plans for these structures, furnishes its own inspectors, and does all of the work of construction, except in the case of iron and steel bridges when the plans are made by the department, and the work contracted for by the pound, delivered on cars, after it has been accepted by the company's shop inspector. When there is not sufficient work of any class to warrant the employment of the experts which are required, the head of the department should be capable of making the specifications, checking the plans and inspecting the work. The advantages of having the work performed by the company's employees apply only in those cases where the employees are expert, and it is equally as great a mistake for the department to undertake work which it is not competent to perform, as to obtain bad work through a contractor.

I desire here to emphasize the importance of employing expert service when it is not available on the permanent staff. For instance, if a railway company proposes to construct iron bridges without having in its service a competent bridge engineer, and competent inspectors, and the amount of the proposed work does not warrant the addition of these to the permanent staff, they should be temporarily employed. No man is an expert in all branches of technical work, but he who is expert in one or more, is much better qualified to pass upon the work in those branches with which he is not familiar, than would be one who is not an expert in any branch, and the former will more readily acknowledge the wisdom of employing experts for a temporary service.

It will be impossible for me within the limits of this paper to include a treatise on the details of the work of the bridge and building department, and without attempting to do that, I will skip from one subject to another, giving you hints which you may enlarge upon, and which may lead you to investigate for yourselves.

When the department is well organized it has specifications and standards for all of its regular work. Specifications for ordinary work are easily obtained, and while it is proper for you to draw from all of the sources at hand from which to compile specifications for your own work, I wish to warn you against what I believe is a common mistake of specifying too great refinement in the character of your work. The specification for quality is placed so high that in practice it is found convenient to reduce it and when the work of reduction is commenced it carries other reductions with it, and the result is that you get an inferior article than might have been obtained under a less stringent specification. In drawing up a specification look at it first from your standpoint of engineer for the company, and next from the standpoint of the employee or contractor who is to do the work. In this case apply the rule which will fit all cases in the department "look at both sides." With even a specification of moderate requirements you will not secure work that is absolutely in accord with the letter of the specification, while it may be in accord with its spirit; and yet in case of dispute with the one who does the work, the specification is what you must fall back upon, and if it is moderate in its demands, you will be in a better position to hold the workmen to the contract requirements.

To be Concluded.



## LOCOMOTIVES FOR RUSSIA BY THE BALDWIN LOCOMOTIVE WORKS.

Some time ago the Baldwin Locomotive Works received an order for forty locomotives from the South Eastern Railway of Russia. Twenty of these are for freight and twenty for passenger service. These locomotives are for use upon the State Railway in Southern Russia, and they are adapted for burning petroleum residuum, which is the chief fuel of the railroads of that section. The British Whaleback steamship "Turret Bay" was chartered by the locomotive builders to carry the twenty passenger engines to Novorossisk, a Russian town on the Black Sea, and the other twenty will follow later. The engines were completely erected at the works, and then dismantled, the smaller parts being boxed in packages for convenience in handling, and these of course had to be made small enough to pass through the hatches of the steamer.

The passenger locomotives are of the 10-wheel type with straight boiler, as shown in the accompanying illustration. They are compounded upon the Vaucelain system with four cylinders and piston valves. The tender has slab frames and three axles with boxes in pedestals, and of course the oil fuel introduces a modification in the construction of the tank. With the exception of the tender and the hand rail, screw couplers and the absence of a pilot, the general appearance of the engine is not such as to indicate that it was designed for foreign service. There are some minor details which are noticeable, and which might profitably be used in our designs; for instance, the water tank on the tender is provided with gage cocks. The springs are underhung and the equalizers are placed below the frames. The weight of the boiler is carried directly upon the frames by means of sliding expansion clamps without the use of swinging links. The cross-heads are of cast iron and the guides of steel. The valve motion

Heating surface—	
Flues.....	1645 sq. ft.
Fire-box.....	104 sq. ft.
Total.....	1749 sq. ft.
Gage area.....	20 sq. ft.
Weight in working order.....	139,000 lbs
Weight on driving wheels.....	99,000 lbs

The water tank has a capacity of 486 cu. ft. or 3,600 gals. The fuel tank has a capacity of 236 cu. ft., and is built of steel plate. The tender wheels are wrought iron, steel tired, and 41½ in. in diameter. The journals of the tender axles are 6½x10 in. All the tires of engine truck and tender wheels are held by retaining rings. The driving wheel tires are held by shrinkage and also by shoulder and cap bolts. The cab is of hardwood and of the usual pattern used in this country, and in fact the whole appearance of the engine seems to indicate an intention to give a trial to the methods used here.

## STATE CONTROL OF RAILWAYS VS. THE OBLIGATION OF STATE PROTECTION.

Whenever President Blackstone of the Alton road has anything to say, what he says is generally worth a hearing. In the latest annual report of that road, just issued, he says some things that are not only worth hearing, but need saying, and his words are therefore presented to our readers:

In states in which railroads have been constructed at the expense of non-residents, the railroad history of the last quarter of a century presents some remarkable features.

It is not our purpose to attempt to predict what the people of the states we have referred to will hereafter do in the matter of constructing railroads or in the enforcement of reduced railway rates, but it is an old maxim that history repeats itself, and if the history of organized popular control of railways in such states is to be repeated, it should be of use as a warning, especially to those who may be requested to aid in the construction of new railroads, or the reorganization and repair of bankrupt roads.

of all laws, and especially the common law relative to common carriers; and that railroad property would be taxed on the same basis, with reference to its actual value, as other property is taxed. In these matters, as well as in many others, the just expectations of railway companies have not been realized.

At the beginning of the last quarter of a century there were in the United States 53,400 miles of railroad, or one mile for each 722 inhabitants, and the rates for railway transportation were less than such rates were then, or at any time since have been, in any other country in the world.

With the exception of those in the eastern and middle states, three-fourths of the railroads in this country were then earning no more, and many of them less, than their fixed charges. Under such conditions the people demanded still lower rates, and a law was enacted by the legislature of Illinois, approved May 2, 1873, and similar laws have long been in force in other states, which practically empower railroad commissioners to limit railway rates at their discretion.

An eminent writer upon the subject of railway management, in an article published in the North American Review, in its April number, 1875, referring to this law, asserts that "the Illinois railroad law was ingeniously framed so as to make those who were to use the railroads of Illinois the final arbiters as to what it was reasonable they should pay for such use." More than 20 years' experience under the law has proved the truth of this assertion.

This law practically affords absolute protection against charges in excess of those declared reasonable by railway commissioners, who are appointed by the people to guard and protect their interests. But with reasonable rates the people apparently are not satisfied, and they have long acted upon a plan by which railway rates are reduced below such as are declared reasonable by railway commissioners. This plan reduces the price of railway transportation by increasing its cost. It is based upon contracts made by the state with persons who build railroads for the purpose of making a profit for themselves while the roads are being constructed.

After the state has caused the construction of as many railroads as can be operated with economy, it contracts



BALDWIN TEN-WHEEL PASSENGER COMPOUND FOR SOUTHEASTERN RAILWAY OF RUSSIA.

is of the ordinary Stevenson type with a connection between the link block and the lower locker arm which offsets to pass the forward driving axle.

Metallic packing is used for piston rods and valve stems. The middle pair of driving tires are plain and 6½ in. in width. The forward and back pairs are flanged and are 5½ in. wide, all the tires being 3 in. thick. The driving boxes are of cast steel with phosphor bronze bearings. Brass liners are provided on the wheel hubs. The wrist pins are of cast steel. The frames are of hammered iron, the main frames being forged solid and the front and back lugs are forged on to the front rails for securing the cylinders in place. The pedestal caps are provided with lugs and are bolted to the bottom of the pedestals. The truck wheels are steel tired with wrought iron centers and are 35½ in. in diameter. The axles are of steel with 5½x10 in. journals. The diameter of the boiler at the smoke-box end is 60 in., from which it telescopes toward the rear. The working pressure is 180 lbs. The other principal dimensions are as follows:

Cylinders.....	h. p. 14x26 in.; l. p. 24x16 in
Driving wheels, cast steel, centers, diameter.....	66 in
" " " " outside diameter.....	72 in
Driving axle journal.....	8 in. diam.; 9 in. long
Total wheel base of engine.....	26 ft. 3 in
Driving wheel base.....	14 ft
Gage of truck.....	5 ft
Diameter of tubes.....	2 in
Number of tubes.....	223
Length of tubes.....	14 ft. 3 in
Fire-box, length.....	80½ in
" " width.....	36 in
" " material.....	red copper
Thickness of sheets, side and back.....	½ in
Front flue sheet.....	½ in
Back flue sheet.....	¾ in
Stay-bolts.....	copper

In the matter of railway construction and control, the policy of the people, which is still continued in many states, had been so clearly manifested seventeen years ago that your company decided that unless it should thereafter appear that it had been changed, it would be unsafe for it to make further extensions of its railway, and that its policy should be that which it has since pursued in fortifying its position with reference to such conditions as it has been compelled to contend with.

It was long ago held by the supreme court of the United States that "the charter of a railroad corporation is a contract within the meaning of the contract clause of the federal constitution," but for many years the people of the states to which we have referred apparently have failed to give due consideration to the fact that each railroad company, before commencing the construction of its railroad, entered into a contract with each state in which its road, or any part thereof, is located, and that upon the faith of the state so pledged the company expended a very large amount of money in constructing and equipping its road.

One of the provisions in all such contracts is, in substance, that the state will always permit, and the railroad company shall always have, power to charge and collect reasonable rates for transporting persons and property, and in all cases at the time such contracts were made it was doubtless understood by both parties that the railway rates then considered reasonable should thereafter be so considered, unless new conditions should arise under which the railroad company, by charging lower rates, could obtain a reasonable aggregate compensation for the use of its capital and for its services as a common carrier.

And, especially, as to all such contracts made twenty-five or more years ago, it was understood from their very nature and object, as clearly as though it had been stated therein, that the state, in providing for such public highways as railroads are held to be, would cause no more of them to be constructed than it intended the people should support by payments for their use.

It was also understood that railroad companies would be afforded such protection as is involved in the enforcement

with such persons as we have referred to, for such number of competing roads as will, by the subdivision of traffic and by the orders of its railroad commissioners, force, at least, a part of them to bankruptcy. With bankruptcy staring it in the face, a railroad company does what business men generally do under similar circumstances. Ever hopeful, until the sheriff appears, that failure may be avoided, or, at least, postponed, it borrows money until its credit is exhausted, and sells transportation at any sacrifice to obtain money to meet its maturing obligations; and by reason of the law which prohibits agreements with its competitors, by which expenses might be reduced, its progress to bankruptcy is accelerated. When bankruptcy can no longer be postponed, the road passes to the hands of a receiver, who operates it until those at whose expense it was constructed can be induced to contribute such amount of money as is needed to effect a reorganization, pay the floating debt, and start it again on its downward way to bankruptcy. And thus its history is repeated.

That which we have above outlined has been the experience during the last twenty-five years of more than three fourths of the railroad companies of the country, and, as to many of them, it has been several times repeated.

When a railroad company is struggling to avoid bankruptcy, its more fortunate competitors are compelled to make rates ruinously low to retain their traffic and, therefore, the plan of the people for obtaining cheap transportation on all railroads is successful. The people apparently forgetting their contracts, attempt to justify such action by saying that their object is commercial competition; but there can be no commercial competition in the absence of the right to sell what the competitor has to offer at what it is worth in the market, or in the absence of the right to decline to sell when the market price is not satisfactory. Commercial competition does exist among carriers on the oceans, lakes and rivers, although many of them are incorporated under state charters. They are permitted to sell transportation or to decline to sell it at their pleasure, and are not restricted as to their charges. There are good reasons why such freedom of action cannot



be permitted on railways, but such reasons render commercial competition among them impossible. The result is not competition in the common acceptation of that term; it is strife which causes evils without number, and the confiscation of railway property.

The railroad problem, of which so much is said, is what the people have made it, and it is not surprising that the people find much in it that they would prefer to have the world believe is not the result of their own acts.

In pursuing its railway policy, the state apparently has not considered whether it is consistent with its honor, after having contracted for the construction of railroads and authorized the issue and sale of securities based thereon, to subsequently take such action as it has taken, thereby destroying the value of such securities without compensating the persons who, relying upon its good faith have purchased them. If the state decides that the public interest requires it to destroy such rights as it has granted by contract, or to take or destroy private property of any kind, we presume no one will deny its right to do so by the exercise of its power of eminent domain, and the payment of damages, judicially ascertained; but the destruction of private rights or property, without payment therefor, is manifestly wrong.

There is a very numerous class of persons, especially in the western states, who profit greatly by reason of railroad poverty, and the railroad policy of the people for many years has been, in a great degree, shaped and promoted by them. Such persons obtain advantages over their more conscientious competitors in trade, by inducing impecunious railroad companies to secretly reduce railway rates in consideration of their patronage, and they have long since learned that when the company yields to their solicitation, it is ever poverty, and not the will, that consents. In the nature of such cases, lawful rates would be insisted upon if the pressure of need were not too strong to be resisted.

By reason of the course the people have pursued, there are four or five times as many competing railroads as are needed and only about one-fourth, consisting of those most advantageously located and such as have superior facilities, have for the last 25 years been able to earn dividends. The remaining three-fourths of the railroads for the greater part of that period have earned less than their fixed charges; and although hundreds of them have been sold in bankruptcy, reorganized and repaired, very few if any of them have thereafter earned any return whatever for those who have contributed the cost thereof. Such contributions, aggregating many millions of dollars, have been made with the hope that with an increased development of the country, and the consequent increase of traffic, the people would permit increased net earnings by which at least a part of the cost of the roads might be saved; but although the expected development of the country and the increased amount of traffic have been realized the states have continued to contract for railways to subdivide the traffic, and railway commissioners have continued to reduce railway rates to such extent that in many parts of the country the net earnings per mile of railway are less than such earnings were 25 years ago. It therefore appears in nearly all cases that the money contributed in the hope of saving such properties has been, in effect, contributed to enable the people to continue to enforce railway service at less than its actual cost.

It is difficult to ascertain precisely what the total reduction of railway rates during the last 25 years has been, but, approximately, in the western states the average of passenger rates was at least 50 per cent, and the average of freight rates at least 100 per cent higher in 1870 than in 1895. In view of the fact that at all times during that period the average of operating expenses has been equal to from 65 to 75 per cent of the rates charged, it is easy to see that such reduction of rates has, in the case of most roads, naturally led to bankruptcy. It is, however, but just to say that so far as we are advised, when railway commissioners have ordered rates reduced they have acted in accordance with the imperative wishes of those by whom they are employed. Under such conditions the railway mileage of the country has been increased during the last quarter of a century 237 per cent, while during the same period the population of the country has increased, approximately, 78 per cent; and still in many states there is a standing invitation to contract for the construction of railroads under laws that require no inquiry as to the use that can be made of them when completed, or at any time thereafter.

Comparing Great Britain and Ireland, Belgium, France, Germany, Russia, Austria-Hungary, Italy and Spain with the United States, we find that in the European countries named there is an average of 2,617, and in the United States only 380 inhabitants for each mile of railroad. In the European countries last named the total railway mileage reported is 127,673 miles, or about 71 per cent of that of the United States, and the total population is about 335,000,000.

The average rates for railway transportation in Europe are from 50 to 100 per cent higher, and the wages of railway employes, on which the cost of railway transportation largely depends, are only about one-half of those paid in this country.

In the matter of governmental control of railway rates—for example, in France, where six of the seven railway systems are operated by corporations chartered by the state—the state reserves the right to limit the charges for transportation, but it guarantees the payment of the interest on the indebtedness of the corporations, and also a specified rate of dividends on the railway shares. If the net earnings of the road are not sufficient for such payments, the deficit is paid from the national treasury. That the right of a government to reduce railway rates involves the duty to protect railway companies from loss by reason of such reduction in that or in some other way, is recognized in all European countries.

A fraction of a cent in railway rates is, comparatively, of little consequence to each railway patron, but with the railroad company it is multiplied many times, and it measures the difference between a reasonable profit and the ability to render good service on the one hand, and loss and inability to render such service on the other.

If the time shall come when every railroad company in this country shall have reason to feel that it is justly

treated, and that it is possible for it, by lawful service, to ward off impending bankruptcy, the temptation to unjustly discriminate by secret rates and other unlawful practices will be mainly removed, and we may expect a rivalry among railroads prompted by their own interest, in which each will strive to outdo the other in safety and promptly transporting persons and property, and in the excellence of their accommodations and service. But for such a rivalry a just and reasonable support is an indispensable prerequisite.

The experience of the last quarter of a century has demonstrated that the power of the people over railway property is practically without restraint, and, necessarily, they look upon railway matters through the medium of self-interest. Whatever may be said of their intentions, the result of popular control of railways has long been, in most cases, either total or partial confiscation.

It is difficult for us to understand why the rights of those at whose expense railroads are constructed are not as justly entitled to protection by state and federal laws as the rights of those who use them; but, apparently, the people are as confident that they have the right to demand and enforce railway service upon such terms as may be in accordance with their will and pleasure as ever men were of their right to demand and enforce services on like terms from persons who were subject to their power.

Unless popular sentiment in this country shall so change as to practically recognize the principle—as it is recognized in other countries—that railway control by the state in the interest of the people involves the duty of the state to protect the just rights of those at whose expense railways are constructed and operated, we see no reason why we may not expect the railroad history of the last quarter of a century to repeat itself.

#### PNEUMATIC HAMMERS.

The pneumatic hammer has evidently come to stay. It is now being used in a large variety of work and its field of usefulness is becoming rapidly extended. The accompanying illustrations show two classes of work to which it is being applied, Fig. 1 being an interior view of the boiler works of James McNeal & Bros., in Pittsburgh. The work in hand is the Alle-



PNEUMATIC HAMMER AS A CAULKING TOOL.

gheny City pipe conduit and it is stated that with a pneumatic hammer one man can readily calk 600 ft. of the plate, which is  $\frac{1}{2}$  in. thick, in nine hours. A number of hammers have been in constant use on boiler work in this shop for some time.

The illustration Fig. 2 shows a view of a portion of a large steel plant in Pittsburgh where the hammers are in use for chipping fins from steel billets, a large plant having been established for that purpose. It is stated that the results on this class of work have been particularly satisfactory. The hammers shown



PNEUMATIC HAMMER AS A CHIPPING TOOL.

in these illustrations are the invention of Mr. Chas. B. King, of Detroit, Mich., who has been making a careful study of the tool and succeeded in putting out a hammer which is very simple in construction and has only one moving part. It is called the King valveless hammer for the reason that the piston or striker is its own valve and the only moving portion of the tool.

Some of these hammers were on exhibition at the world's fair in Chicago, and were given an award. It is claimed that numbers of them have been in use for more than one year without receiving repairs of any kind whatever. In chipping cast iron or steel or in cleaning castings one tool is said to do the work of three men using hand hammers and on boiler and ship work they will do the work of five or six men.

Hammers of this type are being used successfully for calking, driving rivets, chipping, carving stone, driving nails and a great variety of work, and it behooves those having work of this character to look carefully into this subject as there appears to be great economy in the use of this tool.

#### THE NINETY AND NINE.\*

J. N. BAIRD.

"What man of you, having an hundred sheep, if he lose one of them, doth not leave the ninety and nine in the wilderness, and go after that which was lost until he find it."

In quoting the above as an introduction to a technical discussion, the writer wishes to say that he does so with the utmost reverence. This wonderful illustration of one of the noblest attributes of humanity, the tendency to help those in trouble, to save those in danger, even at the risk of those not immediately concerned, will never lose its freshness and vigor.

It is the intention, however, in this paper, to take the illustration out of the region of ethics and apply it to that very practical question to-day of economical railway operation. It will be found on close, or even casual, observa-

tion that the human mind in overseeing matters connected with railway operation, is very apt to turn on its energies in one particular direction as circumstances may dictate. The lost sheep which has attracted particular attention by the fact of its being lost, will be followed with the most praiseworthy assiduity, while the ninety and nine are left in the wilderness to the tender mercies of the wind and the wolves.

This is especially true of railway operation, which, on account of the magnitude of the business, is necessarily

\*A paper read before the Western Railway Club, January 21, 1896.



divided into numerous departments, in charge of persons many of whom are far removed from each other, and whose interests are inimical to each other.

The word "inimical" is used advisedly in this connection, for what is to the interest of one department of railway work is often detrimental to the interests of another department, and the finest judgment is required in cases of this kind to determine whether the advantages accruing to one department by a certain policy, may not be worse than nullified by its influence on other departments.

For the purpose of this paper railway work may be divided as follows:

1. Getting traffic.
2. Getting adequate compensation for transporting the same.
3. Transportation of the traffic.
4. Maintenance of the motive power and rolling stock.
5. Maintenance of permanent way.
6. Purchase of materials and supplies.

It is not intended that this classification shall be complete. But the above six items cover the main items in railway operation, which are so interdependent that action in one is frequently felt in others, so that any proposed course of action by one of these six departments must be carefully scrutinized and the effect of the same on the other departments must be carefully weighed before the true economic value of the same to the railway company as a whole can be determined. It is assumed that the total aim and end of a railway company is to furnish transportation satisfactorily, as nearly as may be, to those desiring to purchase the same, and to obtain from the proceeds of such sale a sufficient amount after all expenses are paid to give a reasonable return on the capital invested.

It is proposed in this paper to discuss a few of the points in which the overlapping of interests as detailed above make some of the so-called advances and improvements in railway operations of doubtful utility.

To get traffic is one of the most important functions of railway work especially with competition as keen as it is in nearly all sections of the country at the present time. In fact, on many roads this function is considered of such importance that the traffic department dominates all others. As long as the traffic department confines itself to getting traffic and adequate rates for transporting the same, the matter is perfectly plain. If a reduction in rates is resorted to, the traffic department knows just what its success costs it. If it pays rebates there is still no doubt of its being able to figure what it costs to procure the traffic. Unfortunately the cost in such cases is so palpable that there is hesitation in going far in this direction. The freight officials cast about for other inducements to secure traffic, and they must be of such a character that the cost will not be quite so evident as the means mentioned above. There are plenty on hand and the freight official displays marvelous ingenuity in devising inducements to offer to shippers, which inducements are to be furnished by and at the expense of other departments. Among the principal inducements thus offered are:

1. Increased speed of trains.
2. More frequent trains.
3. Special cars.

There is no question but that increasing the speed of trains means:

1. Increase in weight and cost of motive power.
2. Increased cost of maintenance of same.
3. Increase in cost of fuel per ton mile.
4. Increase of cost of car repairs.
5. Increase of cost of maintaining permanent way.
6. Increase in loss from accidents.
7. Increased expense to secure safety.

In fact there is nothing, possibly, more far reaching in its effect, so far as increase in expenses is concerned, than this one item of increased speed of trains; and there is possibly nothing more frequently demanded by the traffic department. It is of course a difficult matter to form an estimate of percentage of increase in cost per ton mile for a given increase of speed of trains, but a comparison of a division doing a heavy live stock business with one doing little or none of this class of business, throws considerable light on the subject.

Increasing the frequency of trains to meet the demands of shippers or to offer traffic inducements, is not as far reaching in its effects as increasing the speed of trains, but it has the effect of reducing the average weight of trains hauled, causing all the disadvantages resulting therefrom.

The case of special cars is somewhat peculiar and complicated. Refrigerator cars, for example, are undoubtedly a necessity and are demanded by the requirements of traffic. The same is true of stock cars, coal cars, and a number of others which have apparently grown into the position they occupy. In the case of furniture cars, which are simply box cars too large for ordinary economic service, a number of interesting questions arise, and this is especially true in the case of furniture cars of unusually large dimensions, which have recently been placed in service. There is little doubt but that these large cars, measuring 40, 45 and even 50 ft. in length, have been furnished with the intention of influencing traffic. The builders of the cars may have carefully considered the increased cost of construction and maintenance, the certainty that nearly half the mileage made by them would be empty mileage, the probability that ordinary cars would stand idle at a point to which these new mammoths are hauled empty; and after weighing all these points it may have been determined that such a size of car is of economic value—but the probabilities are decidedly the reverse. It looks very much to the writer as if these large cars were simply built with a view of enabling the traffic official to offer a rebate to the shippers, which he does not take out of his own pocket, but which is, all the same, taken from the general treasury of the railway company.

In the transportation of the traffic a somewhat similar condition of affairs exists. The main object of the transportation department, after rendering satisfactory service, is to transport the traffic at the lowest figure per ton mile. It has always been considered that the proper steps towards accomplishing this result are as follows:

1. Increase in train loads.
2. Increase in ratio of live to dead weight.

This is undoubtedly correct, and if the transportation department will accomplish these results by having locomotives of a given size transport a greater load, or by securing closer loading of cars to their full capacity, the economical improvements cannot be questioned. But here, as is the case in the traffic department, the transportation department asks aid from the other departments, and to accomplish the desired result of increased train loads and increased ratio of live to dead weight it demands—

1. Increase in size of locomotives.
2. Increase in size and capacity of cars.
3. Increase in rail section.
4. Increase in labor on all the above.
5. Increase in consumption of fuel.

While the transportation officials may be interested in these matters, the interest is not of the vivid character as is the case with the subject of size of trains and payrolls of trainmen. The responsibility for expenses in the other items rests on other shoulders. As a result the demands for locomotives and cars of greater size and capacity, and for rails of greater weight, come from those directly, and to a certain extent exclusively, interested in the transportation of traffic. These demands have been complied with to such an extent that many close observers of to-day feel almost convinced that the economical limit in size and capacity of both cars and locomotives is exceeded in present practice. A favorite argument of transportation men is:—If a locomotive can haul one additional loaded car of 30 tons capacity per train, the earnings of that locomotive will be increased about \$7,000 per year, so that a little increase in expenses for larger locomotives and permanent way is so trifling as not to be taken into consideration. This seems to be the favorite method of figuring in all departments. The gain in the particular department considered is shown to be something very striking—the increased expense to other departments an item not worth considering. If the transportation man would keep his reasoning strictly within the bounds of his own department, and take the position that, if he loads each train so as to get 30 tons additional weight of paying freight into each train hauled by a certain locomotive without increasing the size of the locomotive or the cars, or increasing the number of cars per train, the earnings of locomotives would be increased \$7,000, his position would be unassailable; and if he should carry this theory into practice, the results would be such as to create a very agreeable impression on the minds of the members of that department which is most immediately interested in the immediate net results arising from the operation of the railway as a whole.

In the maintenance of motive power and rolling stock a similar state of affairs exists. The cost of repairs of cars and locomotives, the cost of fuel and supplies, seems to be the paramount consideration. If a locomotive were to make daily trips without a train, the performance sheet would undoubtedly show this locomotive to be the most economical on the system, and the chances are that its performance would be pointed to with pride while its operation had actually been a direct loss to its owners. Of course this condition of affairs could not exist if the value of the service of the engine were based upon the actual tonnage hauled. To determine this, however, requires an increase in expenditure for clerical services, and such an increase is one that is watched with a jealous eye.

The result is that information as to the relative economy of different classes of locomotives is generally of the vaguest character, and the conclusions on the subject are seldom more than more or less intelligent guess work. An inspection of any performance sheet will show one locomotive performing what is supposed to be the same service as another precisely like it in construction, with a consumption of from 10 to 20 per cent less fuel. A small expenditure for clerical labor will definitely fix responsibility in cases of this kind, and this enables the application of a proper remedy. The one lost piece of money is found, but the ninety and nine have suffered much by the saving.

We hear too often the complaints that locomotives are overloaded in service. The pressure in this respect by the motive power man arises from the fact that his eye is on the repair bill and the coal pile to the exclusion of all other items. The coal pile is so large in fact that he cannot see the railroad. The transportation man seems to take a demoniac delight in wearing out the power and burning up the coal pile. This of course can be carried to extremes, but a locomotive should be built so as to permit working to its full capacity without suffering injury or undue wear of parts, whenever it may be necessary, and if it is not so built the motive power man has not done his duty. He should not look to the transportation department to help keep down his cost of repairs and fuel bill by sacrificing the efficiency or economy of a department in which he is not directly responsible.

There are many ways in which the motive power man may, in his search for his one lost sheep, neglect the ninety and nine. In the matter of oil consumption there seems at the present time almost as much attention paid to economizing in its use as is paid to economy in the use of fuel. This may result in making a good oil record, and is a result to be desired, but if by doing this, care in the use of fuel is neglected, dollars may be lost where cents are saved. In fact if attention to the various items of expenditure were proportioned to the amount of the same, the result might show a decided improvement in general results.

In the maintenance of permanent way we see the same overlapping of interest which is observed in other departments. Increase in weight of locomotives and speed of trains is naturally objected to on account of the increase in labor and material required to maintain the track in proper condition. A grade of 50 ft. to the mile reduces the average train 10 per cent. If it were reduced somewhat the train load could be increased with but little increase in expense. But the necessary expenditure would be large and immediate. What is the result? When new engines are required larger and heavier ones are bought. After they have been in service for a while it becomes evident that the rails are failing, and heavier sections are required. In this way the annual operating expenses are indefinitely increased but they are divided among different departments. The expenditure of definite sum to modify the grade would have accomplished the same result, and there all further expenses would have been avoided.

In the purchase of material the purchasing agent sees be-

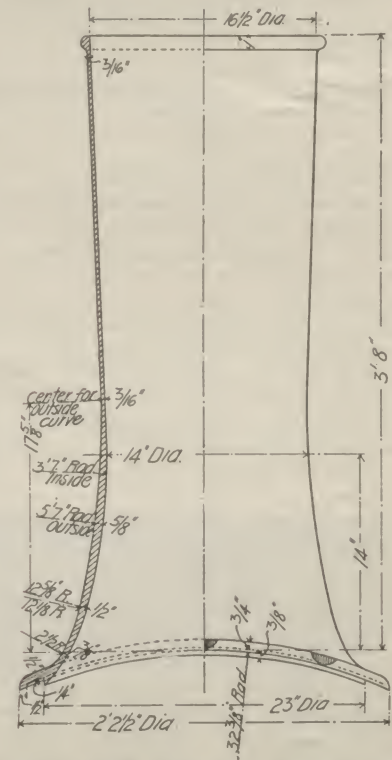
fore all other things the first cost of the article. The quality of the same is much more difficult to determine. The difference in the price must be saved at all cost. This is tangible. A reduction of 10 cents on the bill is 10 cents saved. The only result of this policy may be that for every 10 cents saved there may be a subsequent loss of 10 times as much, but this is difficult to determine, and frequently impossible. Another inducement offered the purchasing agent to buy the material independent of quality arises with the traffic department. If he will buy goods of a certain party they will ship a portion of their product over the road and thus add revenue to the company. This complicates matters so that no one can determine the actual gain by the transaction, and the whole matter becomes so indefinite that an attempt to come to definite conclusions is generally given up in disgust.

The shepherd sees the one sheep which is strayed. The loss is evident. His energies are devoted to the recovery of the same. He cannot determine how much the ninety and nine have suffered by being exposed in the wilderness without a shepherd's care, but when the lost sheep is recovered he calls in his friends and neighbors to rejoice with him, when it is more likely that his proper course of action would be to invite his friends and neighbors to a house of mourning.

The writer has, in the above, endeavored to set forth the complicated relations involved in the operation of a railroad—the danger which arises from one department, in its desire to secure an advantage to itself, requesting another department to stand the expense involved; the danger involved in following some particular fad and bestowing an undue amount of attention to it without weighing its importance in relation to other lines of work. He is aware that this paper may be taken as a criticism of the work of departments in railroading of which he is not entitled by experience to speak with authority. He trusts, however, that this will not be the view taken of the case, and that his intention will be understood as they are intended. And if this paper should have any influence in inducing the head of the department to be more cautious in asking another department to stand the expense necessary to secure an advantage for him, his intention will be fully accomplished.

#### CAST IRON LOCOMOTIVE STACK—C. & N. W. RY.

While the use of cast iron for the construction of locomotive stacks is not new, the design shown in the accompanying illustration is interesting as showing an arrangement combining the stack and saddle casting in one piece. This design was referred to in the issue of January 25 as being in line with improvements which are being made upon the C. & N. W. Ry. through saving the amount of material necessary to be carried in stock, as well as in saving in actual work of construction is effected. This stack is not



CAST IRON STACK—C. & N. W. RY.

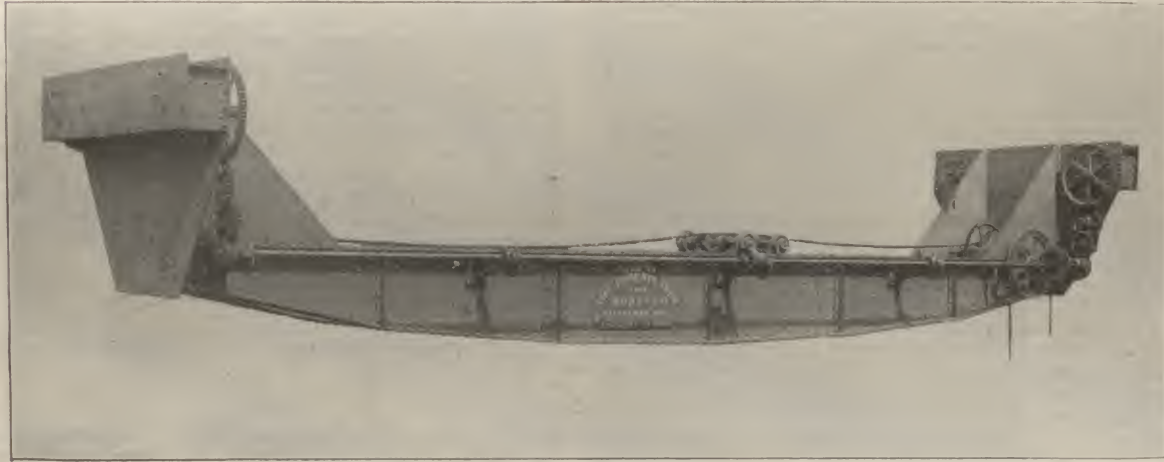
machined at all. The holes for the bolts are cored and the saving effected by the absence of the machined fit between the stack base and saddle, as usually constructed, is abundantly worth while. The proportions of the stack are in accordance with the results of the investigations which have been carried out by the stack and nozzle committee of the Master Mechanics' Association.

It will be seen that the narrowest diameter is 14 in., and the distance of the narrowest section above the crown of the arch is 14 in. The radii of the curves below the straight portion are given in the illustration, together with the thickness of the casting at each point of change, the casting being  $\frac{1}{2}$  in. thick at the part subjected to the greatest cutting action from the cinders. The weight of the casting is about 350 lbs. for a 17x24 in. engine. But three sizes of the stacks are employed, differing only in the upper portion, and any engine on the road may be fitted with one or another of these sizes.



## A NOVEL POWER TRAVELING CRANE.

The accompanying illustration is reproduced from the photograph of a special power traveling crane which has recently been installed in the power house of the Cleveland Electric Railway Company and shows a somewhat novel construction. It will be seen from the photograph that the girder is dropped below the carrying wheels a considerable distance, there being some 8 ft. from the track to the bottom of the girder. This construction was resorted to for the reason that the roof trusses came down to a point almost across the center of the windows of power house. The construction of the track across these windows would be a serious impediment to the light, and also be an unsightly arrangement. In order to avoid this the track was placed above the windows and the girder dropped down a distance sufficient to clear the roof trusses. The span of the crane from center to center is 42 ft., and the capacity eight tons. It is operated entirely by hand power from a cage, not shown in the photograph, which is attached beneath the girder at the operating end. The crane was originally equipped with a differential chain block, but this was afterwards removed and a pend-



CLEVELAND ELECTRIC RAILWAY CO'S. 42 FT. CRANE BY THE PHOENIX IRON WORKS CO. ant manufactured by the Phoenix Iron Works, substituted.

The Phoenix Iron Work Company has during the past year been doing an extensive business in the construction of all classes of cranes, and particularly in the construction of one motor electric power crane which is meeting with great favor wherever introduced. The works of the company are located at Cleveland, Ohio.

## PLAIN AUTOMATIC BRAKES FOR ELEVATED ROADS.

To the Editor of the Railway Review:

In your last issue I noticed an article on the various styles of brakes used on elevated roads, and as this is a subject to which I have in the past given some thought I should like to present a few remarks bearing the same.

It seems to the writer that a great mistake is being made by those elevated roads which are using brakes which are not automatic, and that all such are destined to get a very dear lesson in the great school of experience. The writer is not, on the other hand, an enthusiastic believer in the use of quick-action brake in elevated road service. The best system of air brakes to be used on all short trains, which are required to make very frequent stops, and on which time is such a great object as it is in local passenger runs, would seem to be what is known as the "plain automatic" brake, which, while it is perfectly automatic, has not the violence of action found troublesome with the "quick-action."

Brakes which are not "automatic" in their action were abandoned many years ago by all the surface roads using them on account of several serious objections, which objections, it may be pertinent to remark have not been removed by the mere use of the brake on an elevated structure instead of on the surface. Such brakes can only be set by the engineer. If any part gets out of order so as to make the brake inoperative it is not known until an attempt is made to stop and then it may be too late to avert disaster. If, for any cause any of the trainmen desires to apply the brake, as for example in case some passenger gets caught in attempting to get on or off, he could not do it, and by the time the signal had reached the engineer and he had applied the brake the train may have moved some distance. Another serious objection to the non-automatic brake is that it gives no control to the man on the rear end when the train is backing up, which is so often necessary at a terminal.

The automatic brake on the other hand is always to be relied on unless it serves notice to the contrary. If anything goes wrong an application immediately results and the train is stopped until the defect is located and fixed. If the engineer in approaching the terminal neglects to stop at the right place, either from falling asleep or from some other cause, it is within power of the trainmen to stop the train immediately.

The "quick action" brake was conceived and born of the need of a brake which would prevent shocks on the rear ends of long trains, but while it is quicker of application in cases of emergency, it is open to a number of objections for use on very short trains making frequent service stops. To begin with it has a number of additional parts, involving greater liability to get out of order and a consequent increase in cost of maintenance, to say nothing of more frequent interference with traffic resulting therefrom. With it, the danger of getting "quick action" applications when they are not wanted puts a definite limit on the rapidity with which it can be applied in service stops. On this account it is more difficult to handle in the making of such stops accurately and quickly.

PAUL SYNNESTEVDT.

## The Western Railway Club.

The February meeting of the Western Railway Club was held at the Auditorium hotel, Chicago, on the afternoon of the 18th instant. A communication from Mr. Pulaski Leeds, of the L. & N. R. R., was read, in which a new set of rules for the loading of lumber was suggested.

Further information regarding it may be obtained by addressing the Moore Car Door Company, 819 Rookery, Chicago.

## IRON BRAKE BEAMS AND MALLEABLE CASTINGS.

To the Editor of the Railway Review:

DEAR SIR:—I am informed that one of the largest western roads has abandoned the use of metal brake beams and adopted a wooden trussed beam, and that this road is also substituting cast iron for malleable iron in its freight cars. I should like to have you, through the columns of your paper, state whether this information is correct, and if so give some of the reasons why this practice is being followed. I have been doing a little figuring on this line and cannot make out where the economy comes in, but if there is any should like to know how to get at it. On checking up the weight of these portions of the average equipment I find that a metal brake beam weighs about 60 lbs. and a wooden trussed beam about 160 lbs., and also that a set of malleable iron trimmings will weigh from 1,000 lbs. to 1,500 lbs. less than grey iron castings of equal strength. If these figures are correct a car having metal beams and malleable iron trimmings will weigh about 1,500 lbs. less than the same car having wooden trussed beams and grey iron castings. In a 50-car train this would make a difference of 75,000 lbs., or nearly the weight of an extra loaded car. Now it seems to me that the railroads of this country are hauling around an immense amount of dead weight already and that where changes are contemplated or actually made they should always be in the direction of reducing this instead of increasing it, as it would appear this road is doing.

Many of the largest and best managed roads have been through this subject thoroughly, and it is generally understood that they have all arrived at pretty much the same conclusion, but when we are informed that some one finds they are all wrong and starts off in directly opposite lines it rather destroys one's confidence in the correctness of well established, or what appear to be well established, conclusions. I for one would like to have some further information on this subject and know more about the whys and wherefores.

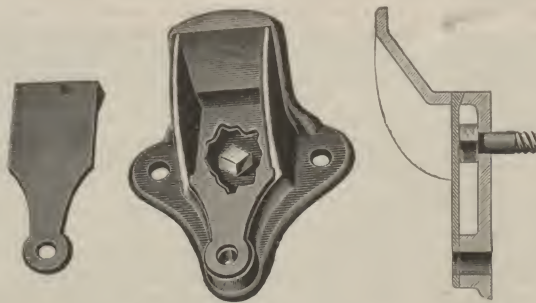
M. C. B.

[The saving which would be effected in the difference in cost of metal and wooden brake beams does not appear to justify the construction of new wooden beams though we know of many roads which are using up old wooden ones.]

If the conditions of which our correspondent speaks were fully known a reason might be deduced for the setting aside of what is considered good practice with respect to the lightening of cars without reduction of strength by the substitution of malleable for cast iron. The use of malleable iron in car construction is rapidly spreading and railroad men generally realize the opportunity which it offers for reducing the weight of cars without attendant disadvantages. Car castings are made with smooth finish and of very uniform dimensions in malleable iron and the greater strength combined with saving in weight renders this material specially suitable and greatly superior to cast iron for this work. The cost, pound for pound, lies in favor of cast iron, but the reduction in weight makes it possible to even save in cost of the completed car by using malleable iron. The figures given by our correspondent as to the possible saving in weight seem rather high, but yet not very much so; though, of course, the proportionate saving will vary with the character and number of the castings in which the substitution is made. The proportion which may be counted upon as being possible to save in weight by the substitution averages about 42 per cent. This figure is an average obtained from a number of different designs of refrigerator cars upon one of the most extensive lines running this form of car. In view of the fact that so many have found excellent results in the use of malleable iron it seems strange that upon any road the return to cast iron is contemplated or actually carried out. This is a form of economy which seems to merit the greatest consideration as it costs nothing and anything which tends to reduce the dead weight of cars would seem to offer such great advantages as to offset any disadvantages which can now be called to mind. The increase in the ratio of live to dead weight is placed next to an increase in train loads as a means for reducing the cost of hauling a ton of freight one mile.—ED.]

## THE MOORE CAR DOOR BRACKET.

Of recent years car thieves have been reaping a harvest by removing the brackets from freight car doors and pulling the lower corner of the door open a distance sufficient to allow them to enter the car. In order to prevent this, burglar proof brackets have been invented, and one of the best of these which has come to our notice is shown in the accompanying illustration as manufactured by the Moore Car Door Company, Chicago. This bracket is fastened to the car by means of four bolts; three of these are exposed as is customary with other brackets, but the fourth



is covered up by means of a plate which is slipped into the bracket proper and forms a pocket for that purpose. When the car door is closed it is impossible to remove this plate, therefore, the bolt cannot be gotten out. It is impossible to loosen the bolt by means of turning the bracket for the reason that any such turning movement is prevented by the door itself. This bracket is strong, simple, and easily applied to the car, and it is claimed that it is impossible to enter a car through a door to which it is applied without leaving traces that some such entrance has been made, and this is all that can reasonably be expected or required of any device of this nature.

## The Civil Engineers' Club of Cleveland.

The regular meeting of the Civil Engineers' Club of Cleveland was held in the rooms of the club, Case Library Building, Tuesday evening, February 11, 1896. Present, 53 members and visitors. Ballots were canvassed on the amendment to the constitution changing the initiation fee for other than honorary members, to \$5, and it was reported carried.

Nominations for the officers for the ensuing year were presented by the nominating committee as follows: President, Charles S. Howe; vice president, James Ritchie; secretary, F. A. Coburn; treasurer, J. C. Wallace; librarian, A. L. Hyde; first director, J. L. Culley; second director, J. C. Beardsley.

The committee on resolutions regarding the death of General M. D. Leggett, submitted their report, and the



resolutions were ordered placed on file and a copy sent to the family:

Resolved, That we, the members of the Civil Engineers' Club of Cleveland, learning with sorrow of the death of our brother member, General M. D. Leggett, desire to express our appreciation of his sterling character, of his worth to our country, our city, and to our club, and our sense of great loss in his death.

He was one of the early members of the club, being elected at the first regular meeting, April 3, 1880.

We have the pleasure of the memory of his late presence with us and of his voice in our meetings. We are proud of the honor of possessing his name for so many years upon our rolls.

The death of Mr. George M. Reid was announced and a committee was appointed to draw up the proper resolutions.

Mr. Walter Miller then gave an interesting talk of "Experiences in an Engineer's Practice."

The bill pending in the house of representatives to fix the standards of weights and measures by the adoption of the metric system, was to have been offered for consideration, but owing to the lateness of the hour this discussion was deferred to the next meeting.

Dr. Dayton C. Miller had on exhibition some of the Case school interesting standard and weights and measures of the metric system.

#### The Technical Club.

A meeting of the subscribers to the Technical Club was held Friday, February 14. Articles of association and by-laws were adopted and the following officers were elected: President, Robt. W. Hunt; vice presidents, W. I. Babcock, E. C. Shankland; treasurer, H. F. J. Porter. Directors—Dankmar Adler, Chas. E. Billin, B. M. Gardner, Geo. H. Lederle, Alfred Noble, A. Sorge, Jr., B. J. Arnold, J. R. Chapman, E. M. Herr, James F. Lewis, Isham Randolph, John F. Wallace.

After the general meeting adjourned, Mr. Hunt called a meeting of the board of government.

Upon motion, Mr. C. E. Billin was appointed secretary for the current year. The directors then proceeded to decide by lot their terms of office, with the following results: Directors for one year—Charles E. Billin, George H. Lederle, B. J. Arnold and J. R. Chapman. Directors for two years—Dankmar Adler, B. M. Gardner, E. M. Herr and John F. Wallace. Directors for three years—Alfred Noble, A. Sorge, Jr., James F. Lewis and Isham Randolph.

The following gentlemen were appointed to act on the committee of admissions for the current year: Messrs. Alfred Noble, chairman; Isham Randolph, B. J. Arnold, J. R. Chapman, E. M. Herr.

The treasurer was instructed to call for initiation fee from subscribers to the club.

The board adjourned subject to the call of the president, it being understood that such call will be made as soon as the committee on quarters is ready to report.

What is claimed to be the largest single pane of glass in the country was received at Hartford, Conn., from Belgium recently. It is 12½ feet high, 15½ feet wide, ½ inch thick, and weighs 1,800 pounds.

#### AIR BRAKE INSTRUCTION CAR—MICHIGAN CENTRAL RAILROAD.

Through the courtesy of Mr. E. D. Bronner, master car builder, and Mr. J. A. Chubb, superintendent of air brakes of the Michigan Central are enabled to illustrate and describe the new air brake instruction car No. 1,299, which has just been completed for that road. In general appearance this car resembles the standard Michigan Central passenger coach with nothing about its exterior to indicate the purpose for which it is used. The interior of the car is finished like a passenger coach and judging from photographs, neatness of appearance was an object sought. It is carried upon six wheel trucks and is

55 ft. long, the space being divided into two compartments, the smaller of which is 10 ft. long and contains the heater, a table, a desk, a sleeping berth and a lavatory. The larger compartment 45 ft. in length is devoted to instruction purposes and contains a complete set of the Westinghouse air brake and air train signal equipment, including the freight and passenger apparatus, locomotive equipment and various parts shown in section, so as to show the interior mechanism.

The freight equipment shown at the left hand side of Fig. 1 consists of twelve sets of brakes arranged in three tiers of four each placed along one side of the car, each set having a full complement of piping, hose and valves necessary for a car. These equipments are not furnished with the rods or levers, the operation ending with the movement of the brake pistons. The brake and signal equipment of an engine and one passenger car is located upon the opposite side of the compartment, shown in Figs. 2 and 3, in which Fig. 2 illustrates the engine equipment and

lease valves and angle cocks, have been placed in the car and among these the cross sections of a freight reservoir, cylinder, triple valve, release, pressure and retaining valves are of special interest. The members of this group are all joined together as they would be used in regular equipment, and it is placed at a high convenient for examination and in such a position that all parts, both inside and outside, can be readily examined. This is a feature which receives a great deal of attention, and it certainly is an interesting subject for study.

The power for operating the pump is obtained from a steam supply outside of the car, and this makes it possible to obtain more space in the car for instruction purposes. The liberal space supplied has entirely avoided the necessity of crowding and what otherwise might be a confused and compact lot of machinery is specially well arranged with reference to allowing the men to approach it closely during the explanations. The car is well lighted and ventilated, is provided with a blackboard for "chalk



AIR BRAKE INSTRUCTION CAR—MICHIGAN CENTRAL RAILWAY—FIG. 1.

Fig. 3 gives a better view of the passenger equipment than that shown in Fig. 1. The engine equipment includes a 9½ in. pump, driver brakes, engineer's valve and accessories for the air brake and also the necessary parts of the air signal apparatus. The passenger equipment is complete in every respect for one car from the auxiliary reservoir to the brake shoes. One side of each of two trucks is shown as they would appear when standing on the track under a car; all the hand brake attachments being included. The car air signal devices and conductor's valves for a car shown in this equipment. Duplex gages are connected to the train lines, reservoirs and cylinders at different points of the system and indicate the air pressure in the several chambers during the the different stages in the full or partial applications of the brakes. Cross sections of all valves and different parts of the apparatus, including even the re-

talks" and every care is taken to keep it in clean and neat condition. The officers of the road are sufficiently sure of the advisability of instruction of employees in regard to air brakes to warrant going into the matter with a view of making the best instruction car which they could arrange, and it is probable that they will be repaid by the better understanding which the men will obtain of the working of the apparatus.

A sand bed for the sub track of a derailing switch is being used on the Saxony State Railway with good results. The rails of the stub track are lower than those of the main or side track, and are buried in sand, the top of which is flush with the higher rails. The sand is from 2 in. to 5 in. deep, and acts very effectively in quickly but gradually retarding the car.

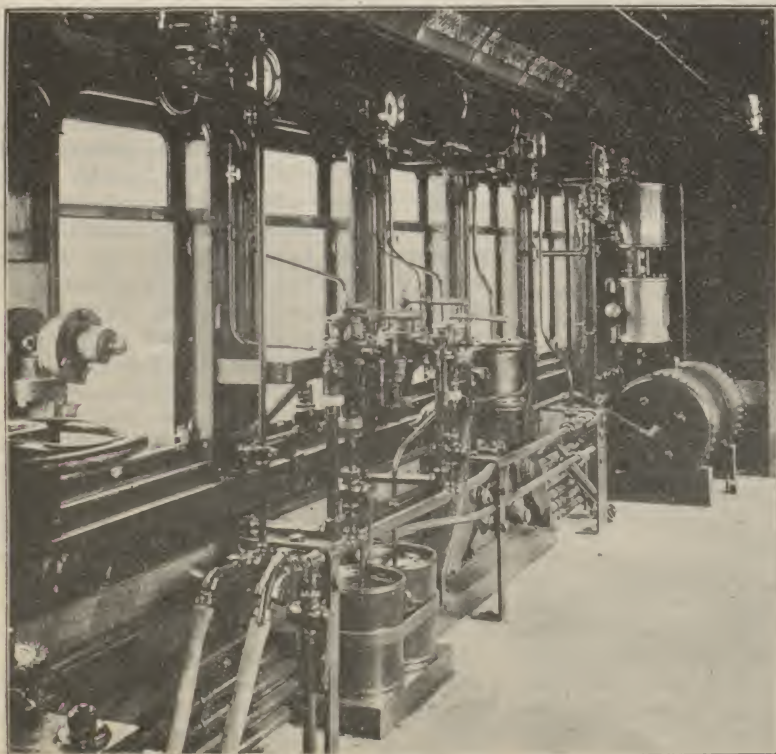


FIG. 2.—SHOWING ENGINE EQUIPMENT.

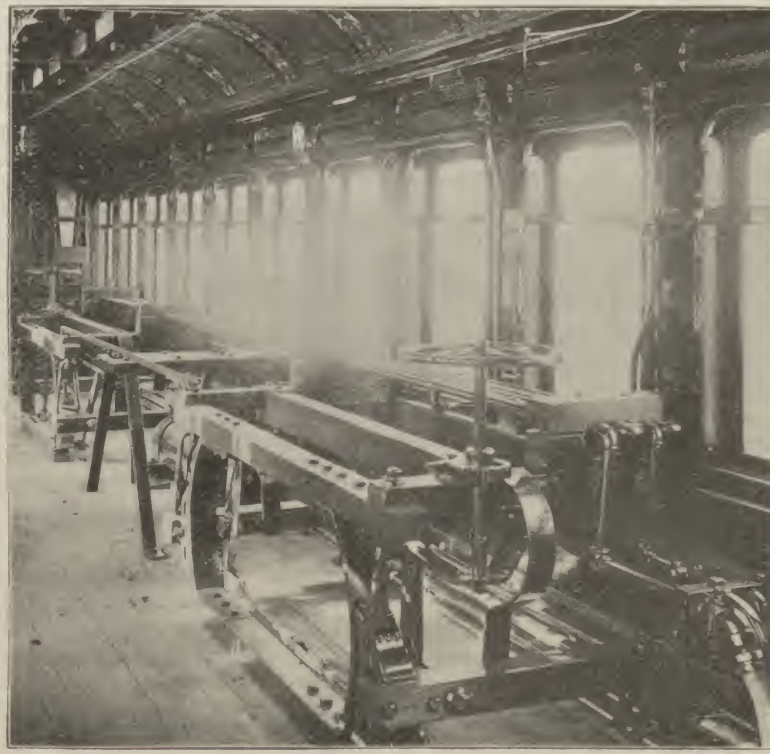


FIG. 3.—SHOWING PASSENGER EQUIPMENT.



# THE RAILWAY REVIEW

OFFICE OF PUBLICATION:

The Rookery, - CHICAGO, ILL.

Eastern Office: 189 Broadway, New York.

## TERMS OF SUBSCRIPTION:

Per Year..... \$4.00  
 Foreign Subscription (including postage)..... 5.00

Convenient binders sent postpaid for \$1.00.

PUBLISHED EVERY SATURDAY: Subscribers are requested to give information of any irregularity in receiving THE REVIEW.

Rates of advertising made known on application.

All remittances should be by Draft, Express, or Money Order, payable to THE RAILWAY REVIEW.

Address all communications to THE RAILWAY REVIEW, The Rookery, Chicago.

CHICAGO, SATURDAY, FEB. 22, 1896.

IRON and steel makers privately argue that quotations must harden when spring business opens, giving as a reason that with midwinter business at a minimum, prices have hardened rather than weakened. The answer to that is, that productive capacity is susceptible of twenty-five per cent increase and that any increase will weaken prices and thus warrant delay. The producer's answer to this is, that with coal, coke and lake ores, and consequently Bessemer pig and steel billets where they are, any reduction in price is simply out of the question, which is substantially true. The most favorable condition of the iron trade is that all the purchases made are for immediate melting and use. A favorable prospect is that all large consumers will in all probability be obliged to become heavy buyers. The evidence of this probability is not far to seek. The railroads themselves need a great deal even at minimum necessities. Lake tonnage is to be increased. There is a general expansion of shop equipments in progress. In short the pressing legitimate requirements for the near future are already hardening prices, but fortunately for consumers any attempt to mark up prices will be followed by a turning of the spigot of production.

In the issue of the RAILWAY REVIEW for February 15, remarks were made concerning the issue of free transportation, special reference being had to the demand by certain educators who, because of their alleged or actual influence in connection with their pupils, sought to compel railroads into giving them free transportation. The moral side of the question was particularly referred to and the enormity of the offense pointed out. That this class of persons is not alone censurable in this regard is established by an incident which occurred shortly before the opening of the present congress. It appears that a gentleman traveling from Chicago to Washington in a Pullman sleeper ascertained that all of the occupants except himself, were members of congress and their families; and he states that he was the only passenger who paid a penny either for railroad fare or sleeping car accommodations. Every other passenger in that car was carried without charge, one congressman having three entire sections for himself and family. Curiously enough one of the subjects discussed was the increasing lawlessness of certain classes and their disposition to evade or disregard statutory restraints and common law obligations. Why such a condition should be deplored by the congressmen in question is difficult to understand when each one of them was guilty of the identical offense they united in condemning; and is it any wonder that the spirit of lawlessness is on the increase among so many classes, and that law is so difficult of enforcement when our law makers are law breakers as well. The fact of legislators riding upon free transportation is by no means new, but that does not make it any the less excusable. Nor does their blindness to their own acts and the moral turpitude involved presage any immediate improvement in this respect.

OUR usually fair minded contemporary, the *American Elevator and Grain Trade*, has been, in common with this journal, an advocate of reciprocal demurrage, often paying us the compliment of reproducing articles from our columns in its pages. In its current number appears an article so reproduced, and under the inspiration presumably afforded thereby

it proceeds to "larrup" the roads for imposing, and the shippers for not more strongly resisting, this charge. In its zeal it is led into making a statement which is at least questionable, namely: "Large shippers or receivers are never required to pay demurrage, and its payment by small shippers is asked principally because the traffic managers feel that they can impose upon them with impunity." Our contemporary is altogether mistaken in this statement. One of the largest manufacturers of cereals in Chicago is charged and pays more demurrage than all of the balance of the dealers and manufacturers in the same line put together. If there is any one thing in connection with railway operation in which no favoritism is shown, it is in the charges imposed by the Car Service Association. In this association, rich and poor, great and small, are put upon a common basis, and charges assessed with as near absolute impartiality as is possible in an institution directed by human beings. It is true that all our car service charges imposed are not collected; and it is also true that in the majority of such cases it is the large firms who do not pay; but that is not the fault of the association. It is the outcome of existing conditions. When the payment of car service charges are refused and persuasive measures fail, two courses are open to the association, either to hold upon their own tracks the freight of such concerns as do not pay, or to sue in the courts for the collection of the charges. The first, if adopted, would result in a peremptory mandamus proceedings which would have the effect of securing to the shipper his property and committing the case to the courts with its attendant long drawn out and expensive proceedings. So that, in either case, the matter would go to the courts with all of the consequent vexations and expense. The arguments for reciprocal demurrage are sufficiently strong to justify its advocacy upon legitimate grounds and our contemporary should not be misled into stating current gossip as facts, in its efforts to contribute to this result.

THERE is at least some prospect that one of the most serious obstacles to the enforcement of the act to regulate commerce will be removed. Even since the law took effect it has been a cardinal principle among railroad men to refuse to bring any action against their competitors for violation of the law. This is believed to have been largely the result of a mistaken idea of brotherly courtesy, although some have been so unkind as to allege that these men refused to throw stones because aware of the character of the houses in which they themselves lived. However that may be it is a fact that up to the present time no railroad man would appear as a witness against another to say nothing of instituting proceedings that were likely to cause trouble to one of their fellows. If reports can be relied upon it will not be long before this mistaken policy will be abandoned. The theory that a railroad official charged with the administration of the property of his employers is bound to protect or defend some other person who is doing his best to destroy the property is, to characterize it mildly, absurd. There has been altogether too much license exercised in the management of these properties, and when it is considered that the service they perform is a public service, and in order to do such service satisfactorily the road must be maintained to a high degree of efficiency, it would appear not only proper but imperative that the aid of the law should be called in to prevent transgressions and protect revenues. It might be a new departure but it would not be at all inappropriate if some stockholder should appeal to the courts for protection against his own employees. Under our present system of railway management it is apparently impossible for a stockholder to protect his property in any other way. But, so far as competitors are concerned no such trouble exists. The evidence which has proven so hard to obtain in connection with violations of the interstate commerce law by those outside of the railroad business, is readily accessible to railroad officials, and the adoption of a policy by a better class of roads to punish violations of the law by railroad officials through an appeal to the court instead of reprisals, would do more towards maintaining the law than any other one thing.

THE much advertised and more expensive Manchester ship canal does not appear to be realizing the expectations of its promoters if the figures for last year's operations transmitted by the United States consul at Manchester are to be relied upon. The canal seems to have been used to some extent by coast-wise and cross-channel boats, but the ocean trade has not, as yet, been diverted from former channels because of the canal. It is stated that although the value of merchandise shipped from Man-

chester to the United States during the past year amounted to more than \$14,000,000, not a single package was shipped direct on ocean steamers. There is possibly a lesson in this experience for the promoters of some of the various deep water schemes now so prevalent in some portions of this country. It takes something besides a harbor to build up a port. Hampton Roads is by all odds the most commodious harbor on the coast, and yet no considerable amount of ocean traffic has as yet been secured on that account. Commercial centers are the result of many other influences than mere transportation possibilities. These, though important, are not necessarily controlling. Commerce is conservative and it is difficult to persuade it away from its accustomed channels. In this matter the law of the survival of the fittest appears to be of little force; instead of it the survival of the strongest is the rule.

Another fact which seems pertinent in this connection is the universal decadence of water routes, both natural and artificial, when brought into competition with railroads. While this proposition is much disputed, the argument of fact seems to support it. It is not intended at this time to discuss the reasons why this is so; indeed, it is more than probable that the theoretical pros and cons would more nearly balance each other than existing conditions would indicate. The fact, however, is none the less apparent, and it is doubtful if the proposed benefits claimed for the extension of water ways to interior points by means of canals, etc., will materialize to any extent. While, therefore, such enterprises may afford magnificent illustrations of engineering skill they will be practically useless for commercial purposes.

THE recent serious accident upon the American liner *St. Paul*, from the failure of one of the main steam pipes, brings up the subject of water hammer due to the collection of condensed steam in pockets in steam pipes, so that when steam is suddenly turned on so as to come in contact with the water, pipe failures are sure to occur, and often with such calamitous results that the necessity for providing proper drainage cannot be too strongly urged. The water hammer is familiar to all, and while the pressures caused by it have been known to be very great there is little experimental data available from which exact information may be had. Some very interesting experiments, however, have recently been carried on by German government engineers at the Royal Dock Yards at Wilhelmshaven. In these tests pressures as thousand pound pounds per square inch were recorded as produced by water action in a six inch pipe about thirteen feet long by admitting steam from a boiler in which the pressure was but seventy pounds to the square inch. It is certain, however that the pressure actually went above two thousand, which was the limit of the gage. The shock was sufficient to burst the six-inch pipe which was nearly a quarter of an inch thick. The rapidity of admission and the location of the water with reference to the passage of the steam has much to do with the force of the hammer, and without detailing the test minutely the most important deductions to be made seem to be as follows: A perfectly drained pipe cannot be destroyed by letting steam into it either slowly or rapidly, even if the pipe be perfectly cool to start with. The only danger incurred by letting steam into a cold pipe which had no water in it was found to be due to a sudden and unequal heating of the pipe. When a large quantity of water is contained in the pipe through which the steam must pass an explosion is likely to occur even with a very slow admission of steam. It was found that if the water was so located that the steam did not have to pass through it, and if the water did not have to be carried along by the steam that no disastrous hammering would occur. The danger seemed to be from the water in motion, and if the incoming steam did not move the water there seemed to be no serious difficulty. An account of the tests states that the water seems to be thrown backward and forward with a wave like motion caused by the influx of the steam. The most serious accidents known to have occurred from this cause have been upon steam vessels where perhaps the confined space had much to do with the fatalities, but it is quite as necessary to guard against such danger by providing all steam pipes with proper drainage.

AS NOTED elsewhere in this issue the General Superintendents' Association, Chicago, in endeavoring to stop the wholesale thievery in car brasses which is now going on in the yards of the various railroads in that city, has brought the subject before the Western Railway Club with the object of securing pledges from the different roads to cease the sell-



ing of scrap brasses to junk dealers. Several of letters were presented with the communication from the Superintendents' Association showing that a number of purchasing agents claim not to sell scrap brasses to these dealers. It was remarked in the discussion, however, that while these officers did not sell the scrap material from brasses manufactured by their own roads that they frequently have sold old material coming from cars belonging to other roads and in which the composition of the brass could not be ascertained. Roads making their own brasses do not care to embody unknown grades of material in their mixtures, and therefore prefer to sell such material. The object of the association is to so regulate the handling of scrap material as to make it impossible for a junk dealer to obtain car brasses honestly, and it is thought that it would assist greatly in the apprehension and conviction of thieves if such regulations could be carried out as to make it impossible for junk dealers to obtain the brasses as they claim that they are now doing, by purchase from the roads. It seems in the first place to be an impossibility to carry out any such plan as is desired for the reason that there is so much of this material which cannot be disposed of satisfactorily in any other way. Again, the possession of car brasses stamped with the initials of any road would not constitute evidence of thievery before the law, and the roads would not in any sense be relieved from the necessity of proving theft in every individual case brought up for trial. It might make it more difficult for the operations to be carried on as they are now conducted, but how this would reduce the thieving is difficult to understand. If such a plan is to be adopted at all the only way in which it can be effective to any degree seems to be in causing all the brasses sold to be melted before passing out of the possession of the roads, but the junk dealers are pretty good at melting, and the better plan is to do what has to be done in any case, namely, catch the thieves. It is not to be wondered at that brasses are so frequently stolen in view of the fact that whole trains of cars when not needed for transportation are stored in out of the way places to which thieves have access. The wonder is that whole cars do not disappear; and it would seem that the only effectual method of stopping this illicit traffic in brasses is by beginning with the source of the trouble; enforcing the law by means of detective work properly followed up. The lawyers would doubtless be somewhat aided in their work by the proposed plan after the material is stolen, but the real problem seems to be to make the stealing itself unprofitable. This was brought out in the meeting as a method which had been found successful in one case, and it is believed that it would be both effectual and cheap, as well as correct in principle.

#### MORE ABOUT BRAKES FOR ELEVATED ROADS.

With the description of the air compressor used upon the Metropolitan Elevated Railroad, of Chicago, which was published in our issue of last week, some claims were presented for the particular system employed in connection therewith which, as stated at the time were, and should be understood as, representing the views of the makers. Our purpose in presenting this description was to show the stated reasons of the road and the manufacturers for the adoption of a straight air system. In regard to these statements the one that in order to reach any average speed that may properly be termed rapid transit the maximum speed should be obtained quickly and maintained as long as possible is heartily endorsed. This result should be the object of any braking system, but it is questionable whether the system described permits of this requirement more perfectly than the automatic quick action brake. In fact it is not too much to say that there is no brake by which this specific result can be so well obtained as with the automatic quick action. Further than this the emergency feature of the last mentioned system which though not often called into requisition, places at the disposal of the trainmen a reliable means for stopping trains suddenly when occasion requires, must be considered in forming an estimate of the best brake system for elevated or any other roads. This is an adjunct which should weigh heavily against any alleged or actual advantages to be gained by the other forms or systems which may provide for stopping more smoothly.

It is unquestionably true that with ordinary handling of the straight air, the vacuum and the quick-acting automatic systems as they are operated today, that the two former give as a general rule, smoother stops, and that in order to obtain such stops with the quick action automatic brake, more care is necessary in the handling of the apparatus

by the trainmen. It is true with the vacuum or straight air systems the graduation of the release may be obtained with greater nicety than with the other system, for though the release of the quick-action automatic may be graduated by two or more steps, it does not permit of the ease of control in this particular possessed by the other type. Unless specially well handled it is necessary with the quick action automatic to release entirely and re-apply the brakes if it is found that the train will stop short of the desired point. The remedy is to apply it at the right time and with the proper pressure.

The claim made in the article referred to is that in order to stop at definite points it is also necessary that the engineer be able to increase or decrease the pressure at will while the brakes are on. It is true that the brake pressure may be more nicely regulated where a partial release may be secured, but it does not follow that the automatic brake cannot be so handled as to secure accurate stops at definite points, though, as already intimated, it requires a little more skill in handling to obtain this result. On the Alley Elevated of Chicago, where the quick-acting automatic is used, the stops are made when necessary within limits of about five feet. It is not necessary in accomplishing these stops to apply the brakes more than once, and as far as can be noticed there is no material difference in the distance from the stopping point at which the two forms of brakes are applied. Any second application of the brakes would result in considerable loss of time. As to the quick release, the automatic quick action brake may be made too quick. With the use of two cylinders, as referred to in the description, the saving of air is, to say the least, open to doubt, because what may be saved by the cylinders would seem to be lost in the train pipe. No figures are obtainable, so far as is known, which show an advantage to the straight air brake in this respect, but it is commonly understood that the automatic uses less air than any system which operates the brakes directly by train pipe pressure or vacuum.

A valuable feature of the automatic brake not found in the non-automatic is that a train may be stopped by the operation of a conductor's valve. This attachment is seldom used even upon steam roads, but cases may at any time arise wherein personal injury to passengers might be saved if the trainmen could stop trains quickly. While it may not be desirable to place a cord running through the cars within reach of passengers, whereby the brakes may be applied unnecessarily, train men might prevent a slight accident from becoming serious if they had it in their power to apply the brakes without the delay necessary in communicating with the engineer. In the case of a broken wheel or derailed truck, for instance, the train men might save valuable time if there was a conductor's valve within their reach. These valves may easily be arranged to be operated from the platform, and safety would seem to demand them. Whatever the form of air brake, some device that will enable a conductor to stop the train would seem to be fully as necessary upon elevated as upon surface roads.

So long as trains are composed of cars which must be coupled together, there will be danger of their breaking in two, and so long as hose connections are used with brakes, a broken or open train line may occur, and there is a danger with a non-automatic system that upon the application of the engineer's valve the requisite pressure will not reach the brake shoes. To sum the matter up, the automatic feature combined with the possibility of making an emergency application in case of need, has placed the automatic quick-action brake in such a position that no other system is considered admissible upon surface roads in this country, and, as a broad proposition, there seem to be no reasons why provision of the same degree of safety should not be necessary upon elevated as upon surface roads, but it is for the officers of such roads, after a full consideration of the matter, to determine for themselves what brakes they shall use; the wide differences of opinion existing upon the subject furnishing abundant reason for such consideration, as well as for the space here given it.

#### THE COMMERCIAL VALUE OF A TECHNICAL EDUCATION.

At this time of the year a great many students in engineering schools are doing a good deal of thinking about how they are to start in active life as the approaching termination of a course at school renders it necessary for them to prepare for employment, possibly to provide a means for paying the indebtedness incurred for their education; but to those fortunate enough to have secured this free from debt, the ques-

tion is not the less interesting. In order to determine as nearly as possible the proportion of new graduates who secure employment in their chosen line of work immediately after leaving school, a writer in *Engineering Magazine* sent out a number of letters for the purpose of obtaining statistics upon this subject, and the results of the correspondence are embodied in a paper entitled "Are We Educating too Many Electricians?" The questions asked in the letters were as follows: "Have you secured a position in the line of engineering since graduation? Was this position secured through any relative? Was this position secured through the influence of friends? Of what does the work you are doing consist? How many hours per day are you employed? What salary do you earn per week?" As a result of this inquiry the information furnished is unique and of real value, indicating as well, perhaps, as it is possible to ascertain, the practical value of what is usually termed technical education. The letters were addressed to graduates from three of the largest technical schools in the country, namely: Cornell University, Massachusetts Institute of Technology, and Lehigh University. Two hundred and seventy letters were sent out in the latter half of September of last year to men who had taken the electrical, mechanical and civil engineering courses. Out of this number replies were received from forty-four per cent of the letters. One hundred and nineteen graduates reported, and out of this number ninety had secured employment within the three months from graduation; and, allowing for a reasonable proportion of the fifty-six per cent who did not reply as having secured positions, about forty per cent of the total number had succeeded in obtaining employment in this short term.

The number of cases considered was too small to obtain a satisfactory idea of the relative merits of electrical, mechanical and civil engineering instruction as regards securing prompt employment, but it is interesting to know that the average rate of pay per week for each class was as follows: Ten dollars and seventy cents for electrical engineers, thirteen dollars and fifty-two cents for mechanical, and thirteen dollars and seventy cents for civil engineers, the working day averaging about eight hours and forty-five minutes. From the statistics given it appears that the electrical graduates received the smallest pay, and from this it is concluded that there is a greater surplus of men in this line than either of the others. The civil engineer receives much higher wages, but it must be considered that work in that field is of very uncertain duration and very much less likely to be permanent. Also this kind of work depends very largely upon industrial conditions, perhaps more so than either of the other branches mentioned. One inference drawn by this writer is that many have rushed blindly into electrical matters, and it is undoubtedly true that many who are educated for this special branch find employment elsewhere, and not in the line for which they were specially educated. The figures given by Mr. Henry Floy, who is the author of the article referred to, show that seventy-nine per cent of the electrical engineers secured employment as against seventy-five per cent of mechanical and seventy-one per cent of the civil engineers. However, only sixty-five per cent of the electrical engineers secured employment in the line for which they were educated as against seventy-one per cent of the mechanical and eighty-seven per cent of the civil engineers. There is nothing in these figures however which should deter young men from entering the electrical field, because it is reasonable to suppose that such records as these if secured from men who have had from eight to twelve years' experience might present a complete reversal of the proportions.

A remark should be added with reference to the special preparation with which engineering students provide themselves. In one of the replies to the letter of inquiry a statement was made by a young man who had succeeded in obtaining a situation to the effect that he had applied to a number of engineers in the hope of obtaining employment, but without success until in speaking of his qualifications he thought of mentioning that he was a stenographer and understood German. The result of adding this information enabled him to secure a position at once, and also to hold his position during hard times when his engineering education alone would not have availed. While this instance does not necessarily form a basis for believing that proficiency in stenography and German should be added to the preparation of all engineers, the result of possession of these acquirements is suggestive that perhaps a too narrow view of engineering education is frequently taken. There is a tendency toward specializing in schools of engineering, and it is believed that the more gen-



eral the education the better will be the preparation for becoming proficient in some special branch of engineering which may afterward be selected, or forced by circumstances upon a young engineer. The engineer can specialize to better advantage than the student. In this connection the following words by Dr. Drown, president of Lehigh University, are exceedingly appropriate:

"My plea is for the introduction of a broader curriculum into engineering schools and for the realization on the part of the teachers of these schools of their responsibility for providing a rounded education for their students. While recognizing fully the dominant importance of the particular study which the student is pursuing, his course should be so arranged that it shall include a fairly liberal amount of studies of general culture. And if it should prove on full trial that this cannot be done as our courses are now planned, without seriously impairing the student's engineering knowledge and training (a result which seems to me, however, very improbable), then I would advocate a course of five years instead of four, that these humanities which belong in the daily life and thought of the educated man, may not be omitted in preparing engineering students for a useful life. It is often said that the place for non-professional studies is in the preparatory schools and that a student should come to the engineering schools with his English, history, and political science behind him, and thus not have them as disturbing elements in his technical course. The objection to this scheme is twofold—first, to the youth of sixteen or seventeen only elementary instruction can be given in these branches, and it is not probable that he will retain any interest in them after entering the higher school; and second, I believe that so far from these studies being disturbing elements in the midst of scientific studies, they come as a pleasant relief and lead the student to realize that there are more things of value in life than can be expressed in figures and formulae."

#### Engineers' Club of St. Louis.

The Engineers' Club of St. Louis held its first February meeting on the 5th instant. The executive committee reported the doings of its 207th meeting, with the following program of papers for the year:

January 8—English Railway Practice, Geo. B. Leighton.  
January 22—Underground Electrical Service, E. J. Spencer.

February 5—Engineering Materials in Compression, J. B. Johnson.

February 19—An Instrument for Testing Gages to 500 lbs., J. H. Kinealy.

March 4—A New Design for a Stadia Board, O. W. Ferguson.

March 18—The Testing of Coals, Arthur Winslow.

April 1—Municipal Engineering, Subdivisions and Grades, Julius Pitzman.

April 15—The Maintenance of Bridges, Carl Gayler.

May 6—The Construction of a Low Crib Dam Across Rock River, J. W. Woermann.

May 20—A New Cross-Breaking Testing Machine, Malver A. Howe.

June 3—Fly Wheels, Herbert A. Wagner.

September 16—The Galveston Harbor Improvements, W. J. Sherman.

October 7—Some Notes on the Operation of the St. Louis Water Works Conduit, S. Bent Russell.

October 21—Boiler Efficiency with Low Grade Fuels, William H. Bryan.

November 4—Steel Frame Construction of High Buildings, Julius Baier.

November 18—Dredging the Mississippi River, Edward Flad.

December 2—Annual meeting, reports of officers and committees.

December 16—Annual dinner, installation of officers, address of retiring president.

The executive committee reported with their approval applications for membership from W. G. Comber, Horace Dunaway and J. L. Van Ornum. They were balloted for and elected. An application for membership was announced from O. H. B. Turner, civil engineer, with Missouri River Commission.

Prof. J. B. Johnson then addressed the club on the subject of "Engineering Materials in Compressive Stress." He explained the development of a formula for the compressive strength of a brittle solid, which was shown to be borne out by experiments. He also gave empirical laws for the relative crushing strength of prisms of various relative heights, and for loads on portions of the upper surface. Also strain diagrams for compressive tests on stone and brick masonry, and concrete. The formula in question was originally developed by Mr. Charles Bouton, a fifth year student at Washington University, and was thought to be original, but later was found to have been arrived at an earlier date by a German engineer. The paper was illustrated by numerous charts, diagrams, and by photographs thrown upon the screen.

The discussion was participated in by Messrs. Baier, Kinealy, Harrington, Flad, Olshausen and Barth.

The Prussian Government has asked for a vote of credit of 5,000,000 marks for building houses for employees of the state railroads. This will permit the building of 3,300 new houses divided into three classes. Twelve hundred of these will have two rooms and a kitchen, and 400 will have but one room and a kitchen. We do not learn what it is proposed that the other 1,700 buildings shall be.

#### THE ENGLISH CAUTION SIGNAL.

To the Editor of the Railway Review:

Your editorial in issue of February 1, entitled "The English Caution Signal" suggests discussion of the idea, and it is to be hoped that one will be had, because the devising of a satisfactory system of night signaling, using some colored light to indicate "clear," is undoubtedly one of the most important signal problems awaiting solution. The distant signal in American railway practice indicates either that all signals to which it pertains are clear, and an engineman may proceed at top speed, limited only by special rules, or else that some obstruction may be ahead and train must be brought under immediate control. It is a cautionary signal pure and simple and cannot therefore properly mean "stop". The English signal, on the other hand, is practically a rear home signal, with a semaphore clearance card attachment, if I may use the term, and if approached in a fog, or located, as many of our signals necessarily must be, with a poor sight, is just as liable to be over run as any other home signal unprovided with a distant.

If we eliminate the "danger, stop" feature from this signal, adapt it to the American practice, and analyze the result, we find a large red and a small green light for caution, and a large green for clear, which is "a combination of red and green for a cautionary indication" substantially as recommended by the American Railway Association committee, the use of the auxiliary arm being entirely unnecessary, as our present signal is eminently satisfactory in day light. It would appear then that stripped of a home signal feature which it never should have had, the device is no improvement over that which our committee has already suggested. It would be liable to dangerous defects in operation. Extinguish the red light and a clear signal would result, the difference in sizes of the green lights being practically indistinguishable, and at best variable.

Much has been said of the danger of combining red and green to indicate caution, as it accustoms the engineman to run past the red; the fact being disregarded that they do this very thing in passing any two arm home signal. The great danger lies in the extinguishing of the red light. I still believe the proper solution to be: "Red for danger", two horizontal green lights for caution, and two vertical green for clear, as suggested by me to Western Railway Club in March, 1895, and practically as used on the Boston & Albany. The extinguishing of any light, or breaking of any glass resulting in "No signal", a contingency already provided for in the rules.

A. H. RUDD, N. Y., N. H. & H. R. R.  
Hartford, Conn., Feb. 11, 1896.

#### A NEW POWER SHEAR—THOMAS CARLIN'S SONS.

The accompanying illustration shows the general appearance of the new power shear manufactured by Thomas Carlin's Sons of Allegheny, Pa. This is known as No. 22, a number of which have recently been ordered for rolling mills and steel works. It is a compact, neatly designed machine, and the lever is operated by a pitman which renders it possible to secure more speed than could be had with the old style cam arrangement, and besides this the weight is greatly reduced in this design. The bed plate is deeper than usual and to provide additional strength the housings for the main bearings have wrought iron links shrunk on over them. The pin is of steel and 5 in. in diameter. The center crank is forged of steel and is 4 in. in diameter. The gearing is 4½ to 1 and the gears have 6 in. faces with 2½ in. pitch. The pinion is double shrouded and is keyed to a 3 in. shaft. The fly wheel is 4½ ft. in diameter and has well proportioned arms. Tight and loose driving pulleys are provided with 8 in. face and a diameter of 24 in. Another feature worthy of notice is the arrangement of the knives giving each of them four cutting edges. Machines of this type are made weighing from 3,000 lbs. up to 40,000 lbs.; the latter being a rail shear; and all of these sizes are furnished with direct connected engines when desired. The machine illustrated weighs 11,500 lbs. Further information with reference to this kind of machinery may be had from the manufacturers, whose office and warehouse is 186-188-190 Lacock street, Allegheny, Pa.

BURNT CLAY BALLAST.—Burnt "gumbo" is being largely used for ballast on the Texas Midland road. A large sum of money has been paid to have this gumbo prepared by burning and several miles between Terrell and Greenville has been ballasted, making, says the engineer of the road, "the best ballast he ever saw." It is as hard as brick and

all the rain of the season has not softened it. He says a road ballasted with it can be kept in repair five years at less expense than a sand ballasted road would cost in five months.

#### Railroad Discipline.

Mr. C. H. Bosworth, general manager of the Chicago, Peoria & St. Louis road, has issued a circular to employees announcing that "on Feb. 1, or as soon thereafter as arrangements can be made to put the scheme in operation, there will be adopted on this line what is known as the 'Brown System of Discipline.'" This, as outlined in the circular, is as follows:

**The System.**—Instead of the discharging or suspending without pay for infraction of the rules of the company, a record will be kept of the mistakes and faults of employees. In this record will be kept a brief statement of the irregularities for which a man is responsible. This record will take the place of the "lay off." When a man commences to make a record in the book, he will be called in for an interview. He will be reminded that if the record gets too long, the company will have to consider him as unfit for the service; he will be shown his failures, and will be given an opportunity to improve. When the record against a man gets so long as to demonstrate his unfitness for the service, he will be dismissed. This record will be a private one, and no employee will be shown any record therein except his own.

**Bulletins.**—In addition to the foregoing record, and for the purpose of making every accident and incident of importance happening on the road a lesson to all trainmen, there will be posted on the bulletin boards brief statements of accidents, mistakes and failures to observe the rules, with comments thereon by the proper official. No names will be mentioned on these bulletins. It is hoped that the examination of these notices will be instructive to the employees, and do much to prevent the recurrence of similar cases.

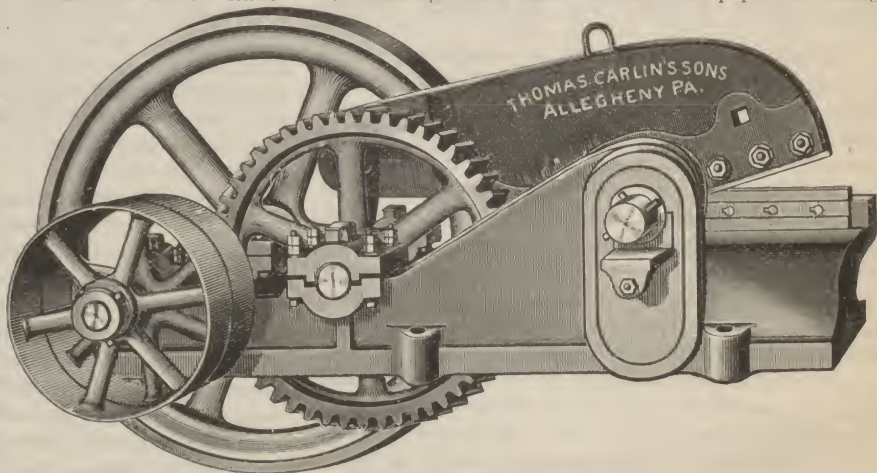
**Conclusion.**—It is confidently believed that with this system in effect, a feeling of more security and confidence on the part of employees will be developed, and that the good men will be benefitted and encouraged, while the unworthy, if there are any such, will be eliminated. It must be understood that co-operation on the part of the employees in the matter of this reform will be of great assistance in producing good results, and that to this end it is very desirable that exactly correct accounts of mishaps occurring on the road shall be furnished by the parties interested. It must be understood that the right to summarily discharge for serious offenses is not given up on the adoption of this plan. The record of the present employees up to date will not be entirely ignored, but it will be put in the background to the extent of giving everybody a new start on the date this change goes into effect.

#### Patents in India. Rules Governing the Preparation and Filing of Applications.

1. All words used in these rules and defined in the said act shall have the meanings thereby assigned to them respectively.

2. Applications and specifications must be neatly and legibly written, printed or otherwise reproduced upon one side only of stout paper of half foolscap size, that is of a size of 13 in. in height by 8 in. in width, and the pages numbered consecutively in the right hand top corner.

3. Drawings must be on either stout paper or tracing



A NEW POWER SHEAR.

cloth, and must be neat and clear. Photographs will be accepted if made or mounted in accordance with the following rules.

4. The left-hand portion of each sheet of drawings to the width of a half sheet of foolscap, that is, a width of 8 in., must be left blank, so that when the sheets are opened out the sheets which lie above them and contain the text of the application or specification will conceal no portion of the drawings.

5. Each sheet of drawings must be (a) of a width not greater than that of a sheet of foolscap, that is, a width of 16 in., except when the size of any single drawing is such that a greater width is required for it; (b) of the same height as a sheet of foolscap, that is, a height of 13 in., except when the size of any single drawing is such that notwithstanding increased width a greater height is unavoidably necessary.

6. A clear margin of half an inch must be left round the portion of the sheet which is occupied by drawings.

7. Reference figures and letters must be clear and bold, and the same letters should be used for the same parts in different views or drawings. In complicated drawings or when there is not room to write the letters in their proper places the letters should be shown outside the figure and connected with the parts referred to by fine lines.



8. The name of the applicant and the year in which the application is made or specification filed, should be shown on each sheet of drawings in the right hand top corner of the blank space left under Rule 4. The sheets when more than one should be numbered consecutively, and the number of each should be shown in the right hand top corner of the sheet.

9. No written description of the invention or design should appear on the sheets of drawings.

10. When a patent has been applied for or obtained in England, a facsimile of the drawings submitted with the English application may be filed without reference to the above rules.

11. Notwithstanding its non-compliance with any of the above rules, the governor-general in council may in his discretion permit any application or specification to be received and filed without requiring the same to be amended.

### BOOK NOTES.

A circular has been received from J. T. Conolly, of Milton, Pa., illustrating and describing a new design of locomotive boiler which is provided with a circular combustion chamber and specially large water spaces over the crown sheet and upon the sides arranged with a view of improving the circulation of boilers and thereby reducing the bulging of fire-box sheets.

**TIMBER.** An Elementary Discussion of the Characteristics and Properties of Wood. By Filibert Roth, special agent in charge of Timber Physics under the direction of B. E. Fernow, chief of the division of Forestry, U. S. Department of Agriculture. Bulletin No. 10. Government printing office, 1895.

Mr. Fernow in his letter of transmittal describes the paper as a brief, comprehensive discussion of the characteristics and properties of wood in general and of our American timbers in particular, which it is hoped may be useful to engineers, architects, carpenters, lumbermen and all wood workers.

Although much of the information contained in this bulletin exists in the experience of practical woodworkers and in books in other languages, it has never before been published in English in systematic and accessible form and with special application to American timbers.

Such a publication cannot, of course, exhaust any part of this great subject. It is desired that it may be followed by a more elaborate treatise when additional knowledge has been gained through the investigations now in progress. The information it contains is largely based on actual experiment and scientific observation, and will, it is hoped, not only explain the experiences of the practical worker with his material, but will remove erroneous notions, and thus aid in improving the practice and lead to a more rational use of our forest resources.

The principal subjects treated are under the following heads: Structure and appearance, weight, moisture, shrinkage, mechanical and chemical properties, durability and decay of wood. Interesting chapters are devoted to methods of distinguishing the different kinds of wood, and the key to the more important woods of North America. There are 49 illustrations used to assist in explaining methods of decay and results of physical tests. The work is a valuable addition to the literature upon the subject of woods issued by this department.

**NEW YORK AS A WINTER RESORT.** "FOUR TRACK SERIES," No. 18. Published by the New York Central & Hudson River Railroad.

This is a pamphlet of 66 pages, illustrated by numerous engravings, many of which are taken from Judge and Frank Leslie's Weekly. It is devoted to the presentation of the advantages possessed by the city of New York as a desirable place in which to spend the winter season. It contains lists of hotels, restaurants, theaters, and other places of amusement, and a directory of the principal stores in different lines. Also a large part of the space is devoted to the special points of interest which visitors should not fail to see. As a frontispiece a map of the city presented in such proportions as to bring the Grand Central station, at the center of everything in sight, which is, of course, the license which must be allowed passenger department officers, with the presentation of the claims of their respective lines. The work is well executed, and is presented with the compliments of the passenger department of the road by Mr. George H. Daniels, general passenger agent. The size of the pamphlet 4x8 in., is much too small for the best presentation of such material.

**HOLDEN'S PATENT SYSTEM OF LIQUID FUEL BURNING.** By Taite & Carleton, 63 Victoria St., London, 24 pages, 8 1/2 x 10 3/4. October, 1895.

This pamphlet has just been received, and it is devoted to an illustrated description of the Holden system which, as our readers know, employs liquid fuel and air introduced above a thin layer of fire of solid incandescent fuel by means of a special injector, and burnt in combination with solid fuel, or alone as may be desired, and this without alteration in the fire-box or furnace. The pamphlet contains the following extract from the Engineer of London, issue of January 4, 1895: "That oil fuel can be used with ease, certainty and great effect is certain. That it is not so used to any extent in this country is no doubt mainly due to the price of the oil. Mr. Holden employs it with great effect on a few engines of the Great Eastern Railway. Mr. Crompton has lately been carrying out some experiments with, we understand, great success for getting over the bad hour at electric light stations. It is well known that the period during which the engines are required to exert the greatest power does not exceed above half an hour. The power curve rising and falling very sharply indeed. Mr. Crompton using a Root boiler to give about 700 horse power when fired at full speed with coal wants 1,000 horse power for a little time, and this he gets by using Mr. Holden's system, and blowing liquid fuel into the furnace for the short period required. The results have, we understand, been very satisfactory, and with oil at anything like moderate price, its use for this purpose would no doubt extend." Illustrations are given of the method of applying the burners to different types of boilers, and the injector and steam fittings for locomotives, and also the regulating valve are shown. The pamphlet closes with instructions for working the system.

### PATENTS ON RAILWAY APPLIANCES.

[The following list of patents granted for inventions relative to railroad appliances for the week ending February 18, is reported especially for the Railway Review, by Chas. L. Sturtevant, patent attorney, Washington, D. C., from whom printed copies can be obtained for 15 cents each.]

- Bagshawe, Bernal, Headingly, England, assignor to Fox Solid Pressed Steel Company, Chicago, Ill., car under frame, 554,641.
- Bake, Cyrus F., Fullerton, Neb., car coupling, 554,970.
- Belk, Matthew, Palmerston North, New Zealand, apparatus for preventing locomotives or vehicles from leaving rails, 554,644.
- Coleman, Sanford, San Francisco, Cal., car coupling, 554,984.
- Cook, Marion P., assignor to C. R. Martin and T. B. Hanna, Denison, Tex., train marker and signal lamp, 554,986.
- Delane, John, Jr., and J. F. Blue, Terre Haute, Ind., railway frog or crossing, 554,911.
- Goodman, Edward H., and S. H. Stupakoff, Pittsburgh, assignors to Union Switch and Signal Company, Swissvale, Pa., switch and signal apparatus, 554,927.
- Hackney, Clem, Joliet, assignor to Fox Solid Pressed Steel Company, Chicago, Ill., pressed steel end sill for cars, 554,678.
- Harriman, Frank H., Hartford, Conn., electrically-operated railway track switch, 554,868.
- Holmes, William J., Pembine, Wis., car standard, 554,693.
- Hutchinson, William F., New York, lighting cars, 554,679.
- Jaeger, Heinrich W. F., Sandusky, Ohio, car door, 554,932.
- Krupke, Herman A., Painesville, Minn., car brake, 555,011.
- Kunz, John, Middletown, Ohio, railway frog, 554,702.
- Leonard, Arthur G., New York, manually controlled electric block signal system, 554,884.
- Redifer, Charles J., Munson Station, Pa., track brace, 554,728.
- Robinson, William, Boston, Mass., assignor to Robinson Radial Car Truck Co., Portland, Me., radial car truck, 554,956.
- Roosevelt, James A., assignor to Franklin Steel Castings Co., Franklin, Pa., draft rigging for railway cars, 555,023.
- Rowell, Benton C., Boston, Mass., assignor to Rowell-Potter Safety Stop Co., Portland, Me., safety system for railways, 554,957.
- Thayer, James H. and H. W., Brooklyn, N. Y., guard for railway cars, 554,898.
- Timms, James, assignor to Buckeye Malleable Iron & Coupler Co., Columbus, Ohio, car coupling, 554,746.
- Tirmann, Hugo, assignor to B. Patterson, Cleveland, Ohio, track sanding device for locomotives, 554,747.
- Tribe, George T., Worcester, Mass., railway car, 554,900.
- Weeks, Parrish C., assignor of forty-nine one-hundredths to H. R. Houston and C. W. Bozarth, Lamar, Mo., car coupling, 554,755.

### TECHNICAL MEETINGS.

The American Society of Civil Engineers holds meetings on the first and third Wednesdays in each month, at 8 p. m., at the House of the Society, 127 East Twenty-third street, New York City.

The American Society of Irrigation Engineers. Third annual meeting will be held at Albuquerque, N. M., September 16-19. John L. Titcomb, secretary, 36 Jacobson block, Denver, Col.

The Association of Civil Engineers of Cornell University meets weekly every Friday, from October to May inclusive, at 2:30 p. m., at Lincoln Hall, New York.

The Association of Engineers of Virginia, holds its informal meetings on the third Wednesday of each month from September to May inclusive, at 8 p. m., at 710 Terry building, Roanoke, Va.

The Boston Society of Civil Engineers, meets monthly on the third Wednesday in each month, at 7:30 p. m., at Wesleyan Hall, 36 Bromfield street, Boston, Mass.

The Canadian Society of Civil Engineers meets every other Thursday at 8 p. m., at 112 Mansfield street, Montreal, P. Q.

The Foundrymen's Association meets monthly on the first Wednesday of each month, at the Manufacturers' Club, Philadelphia, Pa.

The International Irrigation Congress will hold its fourth session at Albuquerque, N. M., September 16-19. Fred L. Alles, secretary, Los Angeles, Cal.; local secretary, W. C. Hadley, E. M., Albuquerque, N. M.

The Montana Society of Civil Engineers meets monthly on the third Saturday in each month, at 7:30 p. m., at Helena, Mont.

The New England Railroad Club meets on the second Tuesday of each month, at Wesleyan Hall, Bromfield street, Boston, Mass.

The New York Railroad Club has a monthly meeting on the third Tuesday in each month, at 8 p. m., at 12 West Thirty-first street, New York City.

North-West Railway Club meets alternately at the West Hotel, Minneapolis, and the Ryan House, St. Paul, on the second Tuesday of each month.

The Northwestern Track and Bridge Association meets on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m., at the St. Paul Union Station, St. Paul, Minn.

The Southwestern Society of Mining Engineers will hold a session at Albuquerque, N. M., September 16-19. Walter C. Hadley, secretary, Albuquerque, N. M.

The Southern & Southwestern Railway Club holds its meetings on the third Thursday of January, April, August and November, at the Kimball House, Atlanta, Ga.

The Western Foundrymen's Association holds its meeting on the third Wednesday in each month, at the Great Northern Hotel, Chicago, Ill.; secretary, S. T. Johnston, 1522 Monadnock building.

The Western Railway Club of Chicago, holds its meeting on the third Tuesday of each month.

The Central Railway Club meets on the fourth Wednesday of January, March, April, September and October, at 10 a. m., at the Hotel Iroquois, Buffalo, N. Y.

The Technical Society of the Pacific Coast has a monthly meeting on the first Friday in each month at 8 p. m., at the Academy of Sciences building, 819 Market street, San Francisco, Cal.

The Civil Engineers' Club of Cleveland, meets on the second and fourth Tuesdays in each month, at 8 p. m., at the Case Library building, Cleveland, Ohio.

The Denver Society of Civil Engineers meets on the second and fourth Tuesdays in each month except July, August and December, when they are held on the second Tuesday only, at 36 Jacobson building, Denver, Colo.

The Engineers' and Architects' Club of Louisville has a monthly meeting on the second Thursday in each month, at 8 p. m., at the Norton building, Fourth avenue and Jefferson street, Louisville, Ky.

The Engineering Association of the South meets on the second Thursday of each month at 8 p. m., at the Cumberland Publishing House, Nashville, Tenn.

The Engineers' Club of Cincinnati has a monthly meeting on the third Thursday in each month, at 7:30 p. m. at the Literary Club, 24 West Fourth street, Cincinnati, O. Address P. O. Box 333.

The Engineers' Club of Minneapolis holds its meetings on the first Thursday in each month, at Public Library building, Minneapolis, Minn.

The Engineers' Club of Philadelphia meets on the first and third Saturdays in each month, at 8 p. m., at the house of the club, 1122 Girard street, Philadelphia, Pa.

The Engineers' Club of St. Louis meets on the first and third Wednesdays of each month, at the Missouri Historical Society building, Sixteenth street and Lucas place, St. Louis, Mo.

The Engineers' Society of Western Pennsylvania holds its monthly meeting on the third Tuesday of each month at 7:30 p. m. at the Carnegie Library Building, Allegheny, Pa.

### PERSONAL.

Mr. George W. Klein has resigned as superintendent of the Reading & Southwestern.

Mr. Stanley E. Russell, representative of the Q & C Co. at Atlanta, Ga., died on the 13th inst. of pneumonia.

Mr. O. W. Greeley has been appointed general baggage master of the Boston & Maine, in place of W. H. Brackett.

Mr. R. C. Vance has been appointed chief clerk to General Coal Agent W. H. Vance of the Wheeling & Lake Erie.

Mr. Richard Barrett, purchasing agent of the Cleveland, Akron & Columbus, has tendered his resignation to that company.

Mr. C. A. W. Pownall, chief engineer of the Japanese government railroads, has resigned that office and will soon leave Tokio to return to England.

Mr. J. M. McConnell has been appointed traveling passenger agent of the Monon, with headquarters at Lafayette, Ind.

Mr. H. H. Kurtz, of the Allison Manufacturing Co., has resigned his position to take, on March 1, that of general superintendent of the Carlisle Manufacturing Co., of Carlisle, Pa.

Mr. E. O. Faulkner has been appointed second vice president and general manager of the Pecos Valley R. Co., vice Mr. Jeff N. Miller resigned. Mr. Faulkner's headquarters will be at Eddy, N. M.

Mr. L. F. Bower has resigned the position of general manager and treasurer of the Carlisle Manufacturing Co., of Carlisle, Pa., to take that of secretary and treasurer of the Dickinson Manufacturing Co. of Scranton, Pa. This will take effect March 1.

Mr. Tom Hale, formerly freight soliciting agent of the Southern in New Orleans, La., has left his desk in that city to take charge of that of general agent of the Ship Island road at Hattiesburg. Mr. Hale carries with him the good wishes of a host of friends.

According to an official circular, Mr. D. H. Nichols, formerly of the St. Louis & San Francisco, has been appointed superintendent of the Pecos Valley Railway Company. All employees in the operating, track and machinery departments will report to him at Eddy, N. M.

The Chicago & Northwestern Railroad Company has appointed Mr. Samuel F. Miller as a general agent of the company, with office at Green Bay, Wis. The office is a new one made necessary by increase of freight business, and jurisdiction extends from Fond du Lac northward.

It has been announced but not officially confirmed, that Mr. John G. Markle for several years past an employee of the Nickel Plate road, has been appointed traveling freight agent of the Chicago, Milwaukee & St. Paul with headquarters in Buffalo, N. Y.

Mr. Walter MacMillan, local freight agent of the Michigan Central at Detroit, has been appointed general eastern freight agent of that road, with headquarters in Buffalo, vice Mr. John Crampton recently deceased.

A circular has been issued by Mr. P. T. Downs, superintendent of transportation of the Gulf, Colorado & Santa Fe, announcing that the office of trainmaster of that road is abolished, effective at once. By this order W. T. Smetten, trainmaster at Temple, and N. R. Pendell, trainmaster at Cleburne, are relieved of their duties, which will be assumed by the division superintendent of the road.

General Manager Hays has officially informed all the officers and agents of the Grand Trunk of the appointment of Mr. E. H. McGuigan a general superintendent of the system east of the St. Clair and Detroit rivers. Mr. McGuigan was formerly superintendent of the western division of the Wabash. The announcement of this appointment is dated Feb. 12, to be effective Feb. 15.

Mr. William H. Thomas has been appointed superintendent of motive power of the Southern Railway to succeed Mr. R. D. Wade, resigned. Mr. Thomas entered railway service in 1865 and held different positions on various roads until September, 1885, when he was made superintendent of motive power of the East Tennessee, Virginia & Georgia, which position he left in 1894, when that road was absorbed by the Southern Railway, at which time he was assistant superintendent of motive power of the latter. He now leaves that position to assume that of superintendent.



Mr. W. I. Church, general freight and passenger agent of the Pecos Valley road, having resigned, that office has been abolished. Mr. E. F. Draper has been appointed auditor and cashier of the same company, having charge of all matters relating to accounts, with headquarters at Eddy, N. M.

At the monthly meeting of the board of directors of the Baltimore & Ohio Railroad Company held in Baltimore, February 19, a letter was received from Mr. Wm. F. Burns announcing that owing to the failing condition of his health he resigned as a director. Mr. Burns repeatedly acted as president pro tem of the company. Mr. George C. Jenkins was unanimously elected to fill the vacancy.

Mr. C. H. Zender has resigned the presidency of the Jackson & Woodin Manufacturing Co. of Berwick, Pa., to become president of the Dickson Manufacturing Co., of Scranton, Pa. The Dickson Manufacturing Co. is reorganized, with new management, and proposes to become an active factor in locomotive and machinery building, ready to make contracts for anything in its line anywhere.

Gen. Irland Smith has tendered his resignation as first vice president of the Baltimore & Ohio and the appointment of Mr. Oscar G. Murray in his place has been officially confirmed. General Smith's time being almost exclusively occupied as a member of the board of managers of the Joint Traffic Association at New York, remains as the representative of the Baltimore & Ohio Co. on that board, and holds also the presidency of several of its important subsidiary lines.

Mr. T. H. Whittemore traveling freight agent of the Iowa Central Railway Co., died of peritonitis on Sunday, February 16, at his home in Cincinnati. In announcing his death General Freight Agent E. C. Palmer says for the present all correspondence pertaining to the Cincinnati agency, which embraces all the Middle States territory, will be transacted in the general freight agent's office at Cincinnati.

Mr. L. L. Hyde has been appointed assistant general freight agent of the Cleveland, Cincinnati, Chicago & St. Louis, with headquarters in Cincinnati. Mr. Hyde will have charge of the tariff and claim department. Mr. R. P. Buchanan, who has hitherto been assistant general freight agent of the Michigan division, has been transferred to Cincinnati, in charge of the business between Cincinnati, Indianapolis and Columbus.

At a meeting of the stockholders of the Central Railroad of Georgia, held in Atlanta on the 17th instant, Mr. H. M. Comer was elected president of that road. This election is permanent, and places Mr. Comer firmly at the head of the affairs of the Central. No permanent board of directors was chosen, but R. T. Dorsey, of Atlanta, and J. S. B. Thompson of the Southern Railway were named as members of the temporary board.

Mr. Benjamin C. Rowell, manager of the Rowell-Potter Safety Stop Company, which is now under contract to equip a portion of the Metropolitan West Side Elevated of Chicago, with safety stop appliances, met with a serious accident on the 19th instant. He was engaged in superintending the work of construction and was struck by a passing train, being thrown from the structure to the street below. The severities of his injuries were somewhat lessened by his falling upon a horse which was passing in the street, but his injuries are very serious and it is feared that he will not recover.

Mr. C. C. Waite, president of the Columbus, Hocking Valley & Toledo, and who for more than a week has been ill of pneumonia in his private car at Columbus, O., died on Friday morning of this week. Mr. Waite is a native of Ohio, having been born at Maumee City in 1843. His first railway work was done in 1864, as assistant engineer on the Rensselaer & Saratoga road. He then went as assistant engineer to the Croton Water Works department, New York City. In 1887 going as chief engineer of the surveying party making the preliminary survey for the Columbus & Toledo road. He then made the preliminary surveys for the Toledo, Akron & Atlantic road, becoming chief engineer of the Cincinnati & Muskingum Valley in 1869, with which road he remained until 1881. From 1881 to 1882 he was assistant to president of the New York, Lake Erie & Western, from which time to 1889 he held the position of vice president of the Cincinnati, Hamilton & Dayton. In 1889 he was made president of the Hocking Valley, which position he held at the time of his death.

## RAILWAY NEWS.

**Atchison, Topeka & Santa Fe.**—A cross bill against the Atchison, Topeka & Santa Fe Co. has been filed in the United States court at Chicago, raising the question of the ownership of the line of the road from Chicago to Kansas City, denying the claim of the bonds held by the Union Trust Co. and under which foreclosure proceedings are now pending, in pursuance to the general plan of reorganization. The complainants are all eastern parties, and claim to own 628 bonds of the denomination of \$1,000 each, of the issue of January 1, 1887, and assert that they are the only outstanding bonds of that issue. On the other hand the reorganization, or new company, which recently purchased the road at sale, claims to be the owner of 14,721 bonds of the same issue, which were pledged as security to the Union Trust Co. for the general mortgage of October 15, 1889.

**Bethel Railroad.**—The old Bethel R., from West Middlesex to Bethel, Mercer county, Pa., is now being torn up and the rails are being shipped to Pittsburgh. About six years ago Simon Perkins, who owned the Bethel coal mines, had the road built at an enormous cost, simply to get even with the Erie and Pittsburgh & Erie, who were charging enormous freight rates. The road was five miles long, and resulted in connecting the Baltimore & Ohio R. with Middlesex. When the Erie and Pittsburgh & Erie realized that they would have competition down went their freight rate, and a freight or passenger train was never run over the new road. This is probably the only railroad in the United States that was built and never used.

**Carolina, Knoxville & Western.**—The date for the sale of the Carolina, Knoxville & Western under foreclosure is set for March 2, at Greenville, S. C.

**Central of Georgia.**—A lot of real estate known as the overflow property of the old Central of Georgia Railroad & Banking Co., has been sold at Atlanta, Ga., by order of Judge Pardee, of the United States court. The property consisted of unimproved real estate in Fulton and Clayton counties, Ga., on which the sale netted \$65,000, and similar property located in Chatham and surrounding counties was sold for \$58,000. There still remains to be sold some other property at Atlanta, Ga., and also some real estate at Macon and Eufaula. The proceeds of these sales, which will amount to about \$250,000, will be used for paying all claims against the road for work and personal injuries and to pay stockholders and debenture holders who did not go into the reorganization plan.

**Chicago & Alton.**—The annual report of the Chicago & Alton was issued this week, according to which the financial statement for the year shows the gross earnings to have been \$7,044,011.33 and the total disbursements \$6,763,831.44, leaving a balance of \$280,179.89. The item of disbursements includes operating expenses, taxes, rent of leased lines, interest on bonds and dividends. A summary of earnings and expenses for the years 1894 and 1895 is shown as follows:

	1895.	1894.
Earnings from all sources.	\$6,802,486.04	\$6,292,236.54
Operating expenses.	3,982,992.69	3,628,687.20
Net earnings.	2,819,493.35	2,663,549.34
Operating expenses per cent of gross earnings.	58 552-1,000	57 669-1,000
Increase in earnings.		\$510,249.50
Increase in operating expenses.		354,305.49

Increase in net earnings, 155,994.01  
The increase in net earnings in 1895, compared with net earnings in 1894, is 5 855-1,000 per cent.

The number of passengers transported during the year is 2,169,169, being 189,236 more than in 1894. The average distance traveled by passengers is 50.917 miles. The average rate per mile by all passengers was, in 1894, 2.073 cents, and in 1895, 1.932 cents per mile. The number of tons of freight transported during the year is 3,244,279, or 16,943 per cent more than in the preceding year. The increase of through freight, compared with that of 1894, is 34,493 tons, or 6.712 per cent, and the increase of local freight, 435,558 tons, or 19.270 per cent. The average rate per ton per mile was, in 1894, 0.917 of a cent, and in 1895, 0.867 of a cent. The average distance which freight was transported in 1894 was 152.535 miles, and in 1895, 152.550 miles.

**East Louisiana.**—The East Louisiana R., which is about 24 miles in length and runs on the north side of Lake Pontchartrain between Pearl river and Covington, La., is said to have acquired control of the New Orleans & Spanish Fort R., a short line on the south side of the lake. The latter is narrow gauge but is to be made standard gauge, and it is stated that standard gauge cars and engines have already been ordered for this service by the East Louisiana. The road now reaches New Orleans over the New Orleans & Northeastern.

**Florida East Coast.**—The extension of this line southward toward Biscayne Bay is practically finished as far as Fort Lauderdale on New River. The steamer Biscayne will soon be making regular trips between Fort Lauderdale and Miami in connection with the railroad.

**Galveston, La Porte & Houston—Southern Pacific.**—A report is afloat in Galveston to the effect that the Galveston, La Porte & Houston will soon fall into the hands of the Houston & Texas Central and form a part of that system, which is now owned and operated by the Southern Pacific. Hon. Walter Gresham, attorney for the Galveston, La Porte & Houston R., and largely interested in it, is quoted as saying that nothing in the way of a sale could be effected until the suit now pending for the forfeiture of the franchise of the Galveston & Western, which has been absorbed by the Galveston, La Porte & Houston, was settled. The suit was instituted by the city of Galveston for damages for non-compliance with the stipulation in the franchise granted by the city to the Galveston & Western. The case was argued before Judge Brashear of Houston, last week, and he has it now under advisement, and his decision is looked for the latter part of this week.

**Highlands Railway.**—This railway, which was built in 1885-86, under the name of San Bernardino, Arrowhead & Waterman at a cost of \$110,000, but which was in operation but a short time, was recently sold to Mr. H. Kohl of Centralia, Ill., for the sum of \$15,000. Mr. Kohl has given the road the name of the Highlands, and the officers are O. H. Kohl, president; Walter Kohl, vice president; John Anderson, secretary and treasurer, and Prentiss Nisbit, master mechanic. This line is about 12 miles long and runs from San Bernardino, Cal., to the Highlands, the great orange center, and Rables and Harlam Hot Springs.

**Humeston & Shenandoah.**—Feb. 19 is the date for the sale of the Humeston & Shenandoah road. The sale is to be by order of Judge Caldwell at a special term of the federal court, to satisfy mortgage bonds and interest amounting to \$2,629,000.

**Kansas City, Pittsburg & Gulf.**—The proposition for a cash bonus of \$35,000 and right of way into the city, terminal facilities and depot grounds required of the city of Beaumont as an inducement for the Kansas City, Pittsburg & Gulf to build its line through that place on its extension to Shreveport, has been accepted and the money is now being raised. The line is now completed from Kansas City to near Ft. Smith, Ark., 325 miles, and the remaining sections are mostly under contract. Monroe & Lee, of Lawrence, Kas., have 57 miles about completed through the Choctaw Nation and will soon build an 18-mile branch into Fort Smith. Barney Corrigan, of Kansas City, has the first 50 miles south from Shreveport, La., and the construction is now being begun. Work is also progressing from Port Arthur north towards Shreveport. This road is the only outlet to deep water for the 16 railroads now centered at Kansas City, and is justly considered the most valuable enterprise in the west. Port Arthur is now all platted and laid out. Hotels, elevators, factories, railroad shops, etc., are now building. The entire seaport business of Kansas City will be done at Port Arthur.

**Lehigh & New England.**—The Lehigh & New England R. as the old Pennsylvania, Poughkeepsie & Boston R. is now known, has awarded to J. C. Miller & Co. of Bangor, Pa., the contract for building a link of eight miles of new track between Pen Argyle and Benders Junction. The Lehigh & New England is that portion of the old Poughkeepsie Bridge route east of the Hudson river, and it operates a line about 95 miles in length extending from Slatington, Pa., to Campbell Hall, N. Y., on the west side of the Hudson river. This route has been made up by leasing trackage rights for about 40 miles on three sections of the route. One of these is the section between Bender's Junction and Pen Argyle, this track being owned by the Lehigh & Lackawanna (Central of New Jersey). The company will build its own road of the other sections where it now has running rights over the Erie and New York, Susquehanna & Western.

**South Jersey.**—At a meeting of the representatives of the principal bondholders of the South Jersey R. it was unanimously agreed to have Mr. Gowen, receiver of the road, make application to Judge Dallas, of the United States circuit court, for permission to issue \$100,000 receivers' certificates for the purpose of constructing the overhead crossings over the West Jersey tracks, and to build a branch line 10 miles long, from Petersburg to Ocean City. Those present recognized that the only possible means for the South Jersey to extricate itself from its present condition was in the construction of the line to Ocean City, which has been a part of the South Jersey scheme for some time. Plans were discussed as to how to raise the necessary funds for the building of 10 miles of new railroad, which will cost \$80,000, and for the construction of overhead crossings, which are estimated to cost \$30,000 more. Several plans were proposed, one being the organization of an independent corporation to build the new line and issue \$125,000 in bonds and \$125,000 in stock, and lease the new line to the South Jersey on a traffic agreement. The other plan was the issuing of receivers' certificates, which was eventually adopted. It was announced after the meeting that the securities had already been negotiated, and in the event of the court's sanctioning their issue the entire amount would be taken, and the building of the new line and the overhead crossings would be begun at once.

**Trinity, Cameron & Western.**—The various suits against the Link Line (Trinity, Cameron & Western) have been satisfactorily settled. The application for receiver which was filed some days ago, has been refused, but judgment was given for amounts sued for, about \$100,000, in favor of J. P. Schneider, James Belger, Pat O'Donald and Reliance Lumber Co. Execution in all cases is to be stayed six months. It is understood that Mr. Hamilton, of Austin, will within that time have the road well nigh completed.

**York Southern.**—This road, which extends from York to Delta, Pa., a distance of 34 miles, with a branch from Delta to Peach Bottom, five miles in length, has, it is said, passed into the control of the Pennsylvania R.

## NEW ROADS AND PROJECTS.

**Idaho.**—The Boise, Nampa & Owyhee R. Co., which was projected last summer in Idaho, has been incorporated to build from Nampa to Silver City and De Lamar, a distance of 65 miles. Officers have been elected as follows: Edgar Wilson, president; Nathan Falk, Boise, vice president; R. E. Green, Boise, secretary and treasurer; and Fremont Wood, Boise; F. G. Cottingham, Nampa; S. A. Keel, Nampa, and L. A. York, Silver City, directors. Capital stock, \$1,000,000.

**Louisiana.**—The construction train of the new St. Louis, Avoyelles & Northwestern R., under charge of Chief Engineer Sylvester, reached Moreauville on Feb. 12. The track is being laid at the rate of one mile, or more, per day, and it is expected to complete the track to Simmsport before the 25th. A large force of men are also at work on the tap to Marksville, from Long Bridge.

The New Orleans & Northeastern (formerly a part of the Queen & Crescent), is fast making headway in the grading of its tracks along the lake front. Every year Superintendent D. D. Curran does a certain amount of filling in of the low trelling all along the lake front, and this season he has had a large force at work. The Northeastern road is said to be fast getting a reputation of having one of the best roadbeds in the south.

**Maine.**—A preliminary survey for an extension of the Phillips and Rangeley Lake R. has just been completed by Messrs. Matthews and Snowman. The proposed extension, which is to run from Dead River, the present terminus, to Kennebec lake, a distance of some 15 miles, was found to pass through a good timber region and to be without deep cuts or large fills, making a comparatively easy route.

**Michigan.**—Reports have been received stating that surveys have been made for an extension to the Detroit & Mackinac from Lengsville to Omer, Mich. Several routes have been surveyed, but the chief engineer, Mr. A. J. Wenzel, of East Tawas, is quoted as saying that construction will be pushed on this final survey as soon as spring opens. Between Lengsville and Standish the new line will parallel the Michigan Central.

It is reported from Gladstone, Mich., that the Cleveland Cliffs Iron Company is having a survey made for a track from its furnace location at Gladstone to a connection with the Chicago & Northwestern Railway at or near Brampton station. At present ore and other freight is brought down from the mines to Larch and there transferred to the Soo Line, but it is believed that this arrangement is unsatisfactory to the furnace people who want a direct line over one road and propose to have it if they have to build six or seven miles of track.

A proposition to build a branch of the narrow gauge South Haven & Eastern road from Toquin to Paw Paw Lake, is at present being considered by Mr. M. V. Meredith, general manager of the road. The projected line would be in operation only during the summer resort season, and would form a desirable route for Chicago passengers to the resorts at Paw Paw Lake.

**Minnesota.**—It is said that the Duluth & Winnipeg R. (which, it is understood, is controlled by the Canadian Pacific) will be extended to the Mesaba range before the end of the year. The road has not over 150 miles to build,



and as the Duluth & Winnipeg, the Canadian Pacific and South Shore Rrs., have heavy interests on the Mesaba, it is thought that some credence may be given the story. With the road completed to the range the Duluth & Winnipeg would be in a position to compete for the Mesaba ore traffic now monopolized by the Duluth, Mesaba & Northern.

The Duluth & Northwestern, which was incorporated last November by the Merritts of Duluth, and which is to be built from St. Louis bay to a point on some road connecting with the Mesaba Range & Winnipeg, has been located, and it is expected construction will begin in the spring. The line will be about 75 miles in length.

**New York.**—Fulton Chain is the name of a company recently chartered in New York state to construct a standard gage steam railroad two miles in length, from the "Old Forge House" on the Fulton chain of lakes to Fulton Chain Station, on the Adirondack division of the New York Central. The incorporators are Victor Adams, Titus Sheard, Homer P. Snyder, Judson Gilbert, S. F. Garmon, F. H. Burrows and others of Little Falls. Capital, \$60,000.

**Ohio.**—The corps of engineers employed in surveying the new line between Wooster and Bucyrus have entered Crawford county. It is thought by many that the line is being surveyed by the Pennsylvania Co. for the purpose of straightening its line between Wooster and Bucyrus, as, in that distance, there is a loop which takes the road many miles out of its course, and, in the 60 miles, a saving of 18 miles could be made.

A survey is being made in the interest of the Erie Railroad from West Amsterdam on the line of the Niles & New Lisbon R., which the Erie operates under a lease, to the Leadville shaft, west of the city, where connection will be made with the line owned by the Erie running into Youngstown. The opening of this line will give the Erie a short cut to Canfield and New Lisbon, which will be appreciated by farmers and others desiring to reach Youngstown.

The Cincinnati, Hamilton & Dayton is credited with having engineers in the field surveying a line up the Symmes creek valley, in Lawrence county, Ohio, directly opposite Huntington. This survey is for a line about 40 miles long, making a direct line from Huntington to the present line of the western division of the Cincinnati, Hamilton & Dayton at Jackson, O.

**Oklahoma.**—The survey for the Muskogee, Oklahoma & Western has been completed from Enid to Muskogee. The route of the proposed road lies along the south bank of the Arkansas river to Muskogee and from thence to Fayetteville, Ark. It will cross the Rock Island, the St. Louis & San Francisco, the Missouri, Kansas & Texas and the Missouri Pacific roads.

The bill authorizing the Arkansas & Choctaw R. Co. to construct a road through the Choctaw nation has passed the United States senate. The proposed road is to begin on the boundary line between the Choctaw nation and the county of Little River, Ark., and extend northwesterly through the Choctaw nation to the town of Atoka. The road is to connect with the Kansas City, Ft. Scott & Gulf. R. H. Kieth of Kansas City is president and Samuel West of St. Louis is treasurer.

**Pennsylvania.**—The Cheat River R. Co. was recently incorporated at Harrisburg to build a line about 3½ miles in length from a point opposite Point Marion, on the west side of the Monongahela river, crossing the river to Point Marion, and thence to the Cheat river, following its left bank along the state line between West Virginia and Pennsylvania. The directors are W. S. Guffey, Emmet Queen, George Heard, W. F. Johnson, George D. Prentice and Joseph M. Cooper, all of Pittsburgh.

**Virginia.**—The Potomac & Ohio R. Co. has just secured a charter to construct a railroad from some point on the Potomac river near Alexandria, to a point on the West Virginia line within Rockingham or Sheffandoah counties in Virginia. The incorporators are Michael B. Harlow, J. Clinton Forrest, Frederick Mertens and James R. Cator.

A company has been incorporated in Virginia under the name of Danville & Riverside, to construct a road from Danville to a point on the West Virginia state line west of Marion county. The incorporators are: T. B. Fitzgerald, John Schoolfield, James E. Schoolfield, R. A. Schoolfield, F. X. Burton, W. P. Bethel, R. A. James, C. G. Holland, James G. Penn, B. F. Jefferson, J. N. Wyllie, R. I. Anderson, H. R. Fitzgerald and James P. Harrison.

The locating surveys for the first 30 miles of the Virginias R., extending southeast from Huntington, W. Va., along the Guyandotte river, have been completed, and contracts are to be let immediately for the grading. The engineers are in the field locating the rest of the line, which is to extend along the Guyandotte river a distance of 200 miles to the Virginia state line, and thence through the latter state. C. W. Smith, of New York, is president.

Work on the Marion & Rye Valley R. has again been resumed. The road was organized and some grading done about three years ago. When completed the road will be a short line to reach mining properties, and is to extend from Marion, Va., to iron ore deposits in Curran Valley, about six miles. Two bridges are to be built of 200 ft. and 110 ft. long over the Holston river and Staley's creek respectively. It is not expected that more than 20 miles of road will be built this year, but further extensions, which would make the total length of line nearly 50 miles, have been projected, and it is hoped that the one running to Rye Valley—12 miles—may be built this year. P. S. Swain, of 80 Wall street, New York, is president; John S. Apperson, of Marion, Va., is secretary, and David Fox, Jr., of Suffern, N. Y., is the present chief engineer.

A bill has been introduced in the Virginia legislature to grant a charter to the Blue Ridge R. Co. to build a road on the west side of the Blue Ridge Mountains, from Roanoke to Radford, which are now connected by the main line of the Norfolk & Western. Another line is also authorized southwest from Roanoke to Hillsville and Independence.

**West Virginia.**—Contracts have been let for the building of a second track on the Norfolk & Western from Vivian to Bluefield. The recently completed Dingess branch, which leaves the main line near Dingess, is now in use.

A survey is being made in the interests of the Baltimore & Ohio R. for a new line to be built by that company from Buckhannon Junction on the Grafton & Belington branch in Barbour county to Buckhannon in Upshur

county, provided the people of the latter county will vote \$30,000 toward the project.

It is stated that the Cairo & Kanawha Valley R. will build a seven mile extension to Smithville. H. S. Wilson is president. Parkersburg, W. Va.

**Wisconsin.**—The Marshfield & Southeastern R. was incorporated at Milwaukee on Feb. 14. The company acquired the property of the Port Edwards, Centralia & Northern road. The incorporators are Walter A. Scott, Chicago; Thomas B. Scott, St. Paul; H. C. Ross, Chicago; Patrick M. Halloran and A. A. Hopkins of Marshfield. They are also the directors. Capital stock \$400,000.

Surveys in the interests of the Chicago, Milwaukee & St. Paul road have been commenced for a line 32 miles in length extending from Ellis Junction, Wis., northwest to the headwaters of the Oconto river.

## INDUSTRIAL NOTES.

### Bridges.

—At Chillicothe, Ohio, A. W. Jones, county surveyor, states that the following bids were received on February 4 by the county commissioners for constructing a 3 span bridge of 154 ft. each over the Scioto river at that place: King Bridge Co., Cleveland, O., \$8,458; Groton Bridge & Mfg. Co., Groton, N.Y., \$9,600; Iron Substructure Co., Columbus, O., \$9,547; Bellefontaine Bridge Co., Bellefontaine, O., \$8,945; Penn Bridge Co., Beaver Falls, Pa., \$8,750; Variety Iron Works Co., Cleveland, O., \$8,700; Wm. J. Struble, \$9,995; Keepers & Thacher, Detroit, Mich., \$9,420; Milwaukee Bridge & Iron Co., Milwaukee, Wis., \$8,869; Lafayette Bridge Co., Lafayette, Ind., \$9,343; Attica Bridge & Iron Co., Attica, Ind., \$8,460; Brackett Bridge Co., Cincinnati, O., \$9,270; Massillon Bridge Co., Massillon, O., \$8,000; Bradbury & Spencer, Lebanon, O., \$10,986; New Columbus Bridge Co., Columbus, O., \$7,837; Canton Bridge Co., Canton, O., \$8,978; John J. Dunn, Columbus, O., \$9,850; Indiana Bridge Co., Muncie, Ind., \$8,737; Toledo Bridge Co., Toledo, O., \$9,266; Youngstown Bridge Co., Youngstown, O., \$8,460. The contract was awarded to the New Columbus Bridge Co. as being the lowest bidder.

—The Metropolitan Railway Co. proposes to build a bridge over the Kansas river at Central avenue, Kansas City, Kan., at a cost of \$55,000.

—H. H. Filley, city engineer, Kansas City, Mo., has prepared plans for a steel viaduct at Twenty-third street, to cost about \$50,000. The bridge will provide for a double track railway, a 6 ft. sidewalk and a 36 ft. roadway.

—Bids are asked until March 5 for constructing the stone abutments for a bridge over Ten Mile Creek on the Upton road, Washington township, Lucas county, Ohio.

—The city engineer of Syracuse, N. Y., is in favor of constructing a lift bridge over the canal at Mulberry street. It is possible that the state department of public works will soon begin the work.

—The covered wooden bridge over Crabtree creek, three miles north of Raleigh, N. C., is to be replaced by an iron or steel span.

—The bridge department of the Pennsylvania Steel Co., at Steelton, is engaged on a large contract for a four track steel bridge to be built by the New York, New Haven & Hartford Railroad at South Norwalk, Conn. This bridge will require over 1,000 tons of steel and is nearly ready for shipment.

—Bids are asked until Feb. 25 for constructing three iron or Melan arch bridges over the Lackawanna river at Carbondale, Pa.

—The Pittsburgh, McKeesport & Youghiogheny proposes erecting a bridge across the Youghiogheny river at McKeesport, Pa.

—The following bids were received Jan. 31 for constructing a steel drawbridge and approaches, 334 feet in length, over the river at Chaska, Minn:

Bidder.	Piers.		Draw span, ft.
	Stone.	Tubular.	
Chicago Bridge & Iron Co.	\$10,126	\$ 9,587	225
King Bridge Co., Cleveland, O.	11,400	10,200	225
Wis. Bridge & I. Co., Milwaukee	12,007	10,400	*225
Gillette-Herzog Mfg. Co., Minn'polis.	9,849	8,737	246
S. M. Jewett & Co., Minneapolis	11,120	9,600	232
Milwaukee Bridge & Iron Co.	10,449	9,505	224
Wrought Iron Br. Co., Canton, O.	12,690	11,445	242

\*225 or 232 ft.

—Contracts for the construction of an iron bridge over the Chagrin River near Willoughby have been let by the Cleveland, Painesville & Eastern Railroad Co. The iron work was let to the King Bridge Co., of Cleveland, the woodwork to Brown & Co., of Willoughby, and the stone work to Williams Brothers, of Willoughby. The bridge will be in two spans, one of 200 ft. over the river and another of 170 ft. over the highway, together with a wooden trestle 600 ft. long.

—Work on the bridge to be used by the Akron, Bedford & Cleveland Railroad over Tinker's Creek has been recommenced. It will be ready for inspection in a few days.

—The contract for filling 56 wooden bridges on the Chicago Great Western Railway aggregating 8,406 ft. in length and requiring about 130,000 cubic yards of filling has been let to Dale, Bumgardner & Shields of St. Paul, Minn.

—The contract for the drawbridge over Galveston Bay for the Galveston, La Porte & Houston, H. J. Simmons, chief engineer, has been taken by the Missouri Valley Bridge & Iron Works, Leavenworth, Kan. The swing span will be 200 ft. long, trusses 15 ft. 8 in. centers and 27 ft. deep. The drum will be a 24 in. 100 lb. beam. The center pier will be a steel shell, 22 ft. diameter, filled with concrete on pile foundation.

—The county commissioners are considering the question of constructing a bridge to cost about \$35,000 over the Ocmulgee river at Macon, Ga. W. B. Sparks, of Macon, is interested.

—The senate has passed the house bill, to extend till February, 1898, the time for completing the railroad bridge over the St. Lawrence River, in St. Lawrence county, New York.

—Messrs Watkins & Hardaway, of Birmingham, Ala., have received a contract from the Tallassee Falls Manufacturing Co., of Tallassee, Ala., for the erection of a wagon and railroad bridge to be located at Tallassee, Ala., across the Tallassee river. This bridge will consist of two steel truss spans, three steel girder spans, with wooden trestle approaches, entire length being about 2,000 ft. Capt. W. G. Williamson, of Montgomery, Ala., is chief engineer of the work, which has already begun.

—It is stated that M. F. Barrett, town counsel of Harrison, is preparing a bill authorizing the immediate construction of a bridge over the Passaic River at Fourth street, Harrison, N. J.

—The new bridge of the San Francisco & North Pacific Railroad near Petaluma has been opened to traffic. The bridge is a draw, turning on the center, and is of the wooden, arched top, chord pattern. It is 286 ft. long and cost \$6,000.

—A partial list of the bridges carried away and damaged by the recent floods in the east is as follows:

N. Y. & N. E. R. R., Bristol, Ct., old wooden structure.  
D. S. & W. R. R., Brier Creek bridge, Boonton, trestle 450 ft.  
Philadelphia & Reading, Bound Brook, iron bridge.  
Morris Co., N. J., several highway bridges, aggregate cost \$100,000.  
Bangor & Portland R. R., two bridges.  
Neshanic, N. J., iron highway bridge.  
Easton & Northern R. R., four bridges.  
Summerville, N. J., six or seven bridges (two large).  
Central New Jersey, a number of small bridges.  
N. Y., N. H. & H. R. R., Berkshire division, one bridge.  
Hewitt Lane, Pa., iron wagon bridge.  
New York & Northern, Sawmill Run bridge.  
Simmonsville, Conn., Naugatuck river bridge.  
N. Y., S. & W., bridges at Sparta and Stroutsbury.

—The big steel highway and electric railway bridge across the Missouri river at Jefferson City, Mo., is rapidly nearing completion. Three spans are completed and the fourth and last span is half done. The approach on the Callaway county shore is also finished, and the steel approach on the Jefferson City side will soon be under way. The big draw span of the bridge was opened this week for the first time, and the test was satisfactory, the machinery working perfectly. The bridge will be practically completed within four weeks, and will be formally dedicated and thrown open to traffic early in the spring.

—The Berlin Iron Bridge Co., of East Berlin, Conn., has taken the contract to construct an ocean pier at Old Orchard Beach, Me., and will begin work immediately.

### Buildings.

—The Fort Worth & Denver is building a new depot on a considerably extended scale, together with an immense platform and warehouse at Amarillo, Texas. It will occupy space about 200 yards east of the present passenger depot, and both the passenger and freight will be united.

—It is stated that W. Seward Webb, vice president New York Central & Hudson River Railroad, is having plans prepared for a new marble house at Scarborough, N. Y., to cost not less than \$1,500,000. The Sinclair & Young marble quarry at Tuckahoe has the contract to furnish the marble. The house, including verandas, will be about 300 x 130 ft.

—The contract for the new depot at the Toledo, Ann Arbor & North Michigan road at Toledo has been let. Work on the foundation is to begin April 1, and the building is to be ready for occupancy not later than August 15. Another story has been added to the original plans, making four stories, including the basement, the latter to be occupied by a first class restaurant. The first story will contain the ticket office, waiting rooms and baggage office. The two upper stories will be occupied by the general offices of the company. The main entrance of the depot will be on Seneca street, but it will also face Cherry street. The building will be brick and terra cotta, and of the most modern construction throughout. The track will extend up to Cherry street, alongside of the depot and will be provided with modern steel sheds.

—Mr. Bradford L. Gilbert is at work on plans for the addition of two stories to the office portion of the Grand Central Station, New York City. This alteration is rendered necessary by the demand for accommodations for the large clerical force of the New York Central. Several hundred of these employees are now scattered in three or four different buildings in the vicinity of the Grand Central Station. The addition will probably cost in the neighborhood of \$250,000. It is not proposed to make any alterations in the waiting rooms or the train sheds of the station this year. There was some talk a year ago that the New York Central would erect a large office building on the south side of Forty-second street, but that project, it is said, has been abandoned.

—The Sterling Steel Co. is endeavoring to secure a tract of land from the Pittsburgh & Lake Erie Railroad on which to erect an addition to its plant. This has been made necessary owing to the large number of contracts now on hand.

—The National Tube Works Co. of McKeesport, Pa., contemplates the erection of two new welding furnaces, for which the contracts have not yet been awarded. The threading floor is also being enlarged. The works are running fairly full.

—The New Castle Tube Co., New Castle, Pa., manufacturers of seamless steel tubes, is erecting a new rolling mill building in which will be placed two heating furnaces and two sets of rolls. The Shiffler Bridge Co. of Pittsburgh, has the contract for the building, while the A. Garrison Foundry Co. of the same city will build the roll trains, housings, etc. Mackintosh, Hemphill & Co., also of Pittsburgh, will furnish the steel pinions, while the spindles, couplings, etc., will be furnished by the Otis Steel Co., Limited, Cleveland, O. This firm will also commence the erection in a short time of a warehouse which will be 110 ft. square and will be built entirely of brick and steel. Although the plant of this firm has been in operation but a short time they are turning out large quantities of tubing and the output is being increased every day.



—There is practically no doubt that the Ohio Central will build a new depot at Toledo, O. Several plans have been, it is said, drawn up for the building and submitted to General Manager Ferris and President Burke. The only uncertain element in the scheme is the time. It may be built this summer or may be deferred until next season. The proposed plans are for a building which will excel in many respects the company's new depot in Columbus. It will be of the most modern pattern in construction and contain many new features. It is to be located on the present site of the company's old depot on the east side. The company's depot at Columbus will be opened March 1.

—It is officially announced that the Chicago & North-western and Burlington, Cedar Rapids & Northern railway companies will join hands and erect a union depot in Cedar Rapids, Iowa, during the summer that will be the finest in the state of Iowa. The location of the proposed depot is on Fourth street, between Third and Fourth avenues, opposite the city park. The new building will cost \$150,000.

—According to the Boston Standard, a company of Pennsylvania and New Jersey men, with a capital of \$2,500,000, has been formed to erect and equip an extensive ship-building plant in South Boston. The head of the firm will be Benjamin Hollingsworth, and E. B. Price, an iron merchant of Philadelphia, is named as treasurer.

—The union passenger station of the New York, New Haven & Hartford road at Providence, R. I., was burned Feb. 21. The train dispatchers and many employees in the offices had barely time to escape, and all records of the offices were destroyed. The loss will exceed \$200,000.

#### Cars and Locomotives.

—It is reported that the Pittsburgh & Lake Erie Railway is in the market for 500 cars.

—The contract for the 300 freight cars for the Ohio River Railroad reported in our issue of last week has been let to the Ensign Manufacturing Co., of Huntington, W. Va.

—Notwithstanding the official denial of the report that the Cleveland, Lorain & Wheeling were soon to be in the market for cars, some builders are known to have received specifications with requests for bids.

—The Geiser Co., Waynesboro, Pa., has placed another order for six private freight cars with the Carlisle Mfg. Co. These cars have a capacity of 60,000 lbs. and are 60 ft. long.

—A four cylinder compound locomotive, as designed by Mr. George Strong, of New York, with a view to avoiding the counterbalance weights in the driving wheels, is being built by the Maryland Steel Co. for the Balanced Locomotive & Engine Co. The engine will also have two of Mr. Strong's corrugated furnaces in place of the ordinary fire-box.

—General Manager Thomas M. Campbell of the International & Great Northern recently visited Dallas, Tex., in his new car, the Cherokee, which is one of the most beautiful specimens of workmanship ever seen there. The thing about the car of which Mr. Campbell is most proud is that every splinter and every rivet, every truck and every truss from end to end and from top to bottom was made right in Texas and most of the material was grown in Texas. The interior is handsomely decorated with historical pictures, the one of Columbus discovering America being especially striking. All of the work was done at the shops of the International & Great Northern at Palestine.

—The Jackson & Sharpe Co., of Wilmington, Del., has received a contract for building 13 vestibuled cars for the Central Vermont road, and one for four coaches for the Ulster & Delaware road.

—A heavy tank engine, with eight wheels, all coupled, has been built at the Columbus, O., shops of the Pittsburgh, Cincinnati, Chicago & St. Louis Railroad, to work as a pusher on the Madison Hill grade, which rises 413 ft. in a length of 7,012 ft. and this was operated by a rack rail locomotive from 1848 till 1868. The engine weighs 70 tons on a wheelbase of 15 ft. 6 in., and has driving wheels 4 ft. 2 in. diameter and cylinders 22 x 28 in. The tanks extend along the sides of the boiler and carry about 2,000 gallons of water. The engine was designed by Mr. S. P. Bush, superintendent of motive power.

—The Rhode Island Locomotive Works, of Providence, R. I., has received an order from the Boston & Maine Railroad for 20 engines; 7 heavy passenger engines, 7 heavy freight engines and 6 smaller passenger engines.

—The St. Charles Car Co. has just completed a new dining car for the Atlanta & West Point road. The car is handsomely fitted up, red mahogany being used for interior finish.

#### Iron and Steel.

—President Felton is quoted as saying that the Queen & Crescent Company will this spring put down 25 miles of new steel rails.

—The Potter & Hollis Foundry Co., 525 The Rookery, started up its works last week at its new location, Fifty-ninth and Wallace streets, Chicago, to which place the plant was removed from East Chicago, Ind., during the latter part of January. In the new premises this firm has greatly increased casting and general operating facilities. Considerable additional floor space has been acquired, another converter added and the number of men increased, for which, with other conveniences, the change of location was made. The company reports its plant full of work in the manufacture of small steel castings, by its improved process, and views the industrial outlook as being good for future business.

—A dispatch from Alabama states that the Fort Payne steel mills commenced operations on last week. This plant was built some years ago, but did not go into full operation because of the collapse of the business interests of that place. About \$300,000 is represented in its construction and the owners of the plant, believing that it is now possible to utilize Alabama pig iron for conversion into steel, have determined to put it into operation. One furnace was started on February 11. Two heats were made successfully, using basic iron made by the Alice furnace of Birmingham, and a little scrap. The trial is experimental, and if successful the plant will be started up

in full. It is now making ingots, but with the present equipment can work billets and blooms. One hundred thousand dollars has been provided for working capital if these experiments are successful. The plant is of modern construction, but never went into full operation because of the collapse of the Fort Payne boom and the general financial depression. The present plan of operations is based on sound business conditions, and should be successful.

—The Greensboro Furnace Co. has been organized at Greensboro, S. C., with Dr. J. M. Wirth president and H. H. Wirth, treasurer. Machinery for complete equipment of the plant will be purchased.

—The Illinois Steel Co. began improvements last week at the Bay View mills, near Milwaukee to cost \$100,000, and it will make the total expense of improvements for 1895 and 1896 over \$200,000. Work on the new plate mill to take the place of the old mill in the fish plate mill building was begun a few days ago, and it is expected that the mill will be completed May 1. Every department of the Bay View plant of the Illinois Steel Co. is running full time and has been with the exception of a few days in December.

—The annual meeting of the Oliver Iron & Steel Co. stockholders was held a few days ago, at which the old board of directors was re-elected. The company decided to purchase 803 acres of coal land in Pleasant Unity township, Westmoreland county, from the Oliver Coal & Coke Company.

—The rolling mills of the Peoria Steel & Iron Co., Peoria, Ill., are the subject of negotiation by Youngstown (O.) parties.

—The Pennsylvania Railroad Co. has awarded contracts for 31,000 tons of steel rails, divided as follows: Cambria Iron, 6,000 tons; Carnegie, \$5,000; Pennsylvania Steel Co., 6,000; Lackawanna, 6,000. All these rails are to be used on the lines east of Pittsburgh, and contracts have also been made with the Carnegie for 4,000 tons and the Illinois Steel Co. for the same amount, to be used on the lines west of Pittsburgh, the price paid being \$28 a ton to all companies except the Illinois Steel Co., which gets \$29.

—The Pioneer Rail Renewing Co., which leased the North Chicago rolling mill of the Illinois Steel Co., will probably build a plant of its own at Joliet, as the lease on the present plant has expired.

—After a two months' shut down the Johnson Co.'s steel mills at Lorain, O., have resumed operation, working double turn. The mills now roll only 60 ft. rails, and has many good orders booked.

—Owing to the over production of pig iron and the depression in the iron trade the Pennsylvania Steel Co., of Steelton, has banked two of its four blast furnaces for an indefinite period. During the idleness it is likely that alterations to complete the "hot metal" railway system to convey molten metal from furnaces to the Bessemer mill will be made. A new casting shed to replace that which collapsed in October will also be erected.

—Negotiations are under way for the removal of the George B. Sennett Foundry & Machine Works from Meadville, Pa., to Youngstown, O. A site has been practically agreed upon, but some questions as to railroad facilities are unsettled.

—The Sloss Iron & Steel Co. blew in their furnaces at Birmingham, Ala., last week, after being closed for about two years. Its capacity which was originally 200 tons daily, has been doubled.

—A large iron ore mine is being opened up near Gadsden, Ala., by Messrs. Fitzgerald and Smith. The railroad has a force of men at work grading a spur track to the mines and laying sidetracks.

—Hinkle Furnace, of the Ashland Iron & Steel Co., Ashland, Wis., eclipsed in 1895 all its previous records of production, turning out 40,631 gross tons of charcoal pig iron in 350 days' running time, or an average of over 116 tons per day. This is the largest quantity of charcoal pig iron ever produced by a single stack during a similar period of time in this or any other country. The next best years' work of the furnace was 38,304 tons, made in 1892.

—Arrangements have been perfected for building a new foundry at Lorain, O., and work is to be commenced as soon as the weather will permit. The new enterprise is to be a stock concern, with a capital stock to begin with of \$40,000. Among the stockholders are A. J. Moxham and Max Suppe, of the Johnson Co., J. B. Hoge, E. M. Pierce, John Stang of Lorain, and A. L. Garford, of Elyria. The incorporation is to be known as the Lorain Foundry Co. The foundry is to be located near the Johnson Co.'s big steel plant and near enough to the company's contemplated blast furnaces so that molten metal can be taken direct from them when heavy casts are to be made.

A large committee representing the Carnegie Works and the Bethlehem Works, appeared before the senate committee of naval affairs on Feb. 8, to protest against the enactment of Senator Smith's bill providing for the erection of a government armor-plate plant at Washington. Mr. Carnegie and Mr. Wharton who were on the committee asserted that to equip such a plant would cost more than \$4,000,000 and they argued that in view of the fact that immense sums have been invested by private persons in this business at the suggestion of the government, it would be unjust for the government to render that outlay useless by the construction of competing works that could do the work no better and no cheaper.

—The Kellogg Weldless Tube Co., of Findlay, Ohio, is working double time. It produces a high grade of steel, low in phosphorus and sulphur, for the manufacture of cold drawn tubing. The tubes are rolled from an ingot cast hollow by a special process, the sizes ranging from 1½ to 8 in. outside diameter, with various thicknesses. The tubes are used for spindles, hydraulic tubes and presses, pneumatic hoists, roller bearings, piston rods, projectiles, bushings etc.

—A report states that the management of the Bigelow Company, of Fairhaven, Conn., is considering the advisability of moving its boiler and engineering works to Bridgeport. Address George S. Barnum.

#### Machinery and Tools.

—The Granite City Steel Co. possesses one of the heaviest machine tools operated directly by electric motors, built by the Frank Kneeland Machine Co. of Pittsburgh, Pa. The tool weighs over 90,000 lbs., including the motor, and is designed to cut up steel billets 4½ in. square and round bars of a section equal to that of railway axles. The Machine is practically an enormous pair of shears, with knives 18 in. long, 7 in. deep and 2½ in. thick. The bed weighs 44,000 lbs., and its great weight enables the powerful shock due to heavy cutting to be absorbed by the inertia of its mass. The main pin or hinge about which the movable jaw rocks is a low phosphorous steel forging 8 in. in diameter, and is kept from turning in its bearings by a long feather or key. The lever, the movable blade of the tool is 14 in. thick where the knife is attached, this unusual thickness being provided to resist the heavy cross straining produced by dull knives. The electric motor makes but 500 revolutions a minute at regular speed, and is controlled by a specially designed rheostat, so that the start may be made very slowly, an important matter on account of the great power required to start the heavy fly-wheel and the gearing by which the lever is moved.

—Among additions to the equipment of the W. Dewee Wood Co., McKeesport, Pa., is a 75 ton steam hammer. The anvil alone weighs 55 tons. It was made at Alliance, Ohio, and shipped on an eight truck car. It will have a striking power of 75 tons. The old drop pattern hammer now in use will be discarded. The addition to the trimming house of the same plant is rapidly nearing completion, and two new annealing furnaces have been completed.

—A coal pocket designed by the Berlin Iron Bridge Co. of East Berlin, Conn., has recently been erected for the Steinway Electric Railroad Co., at Astoria, N. Y., on the East river, opposite Ninety-second street, New York City. The design is of especial merit as providing a large storage capacity in proportion to the limited amount of ground space occupied. The pocket which is cylindrical in form, is 28 ft. in diameter, 54 ft. high, and has a capacity of 10,000 tons of coal. It is of skeleton steel construction, with vertical angle bars and horizontal flat bands, and is lined with 2 in. tongued and grooved planks. The coal is unloaded from the barge or carts at the side of the pocket, and hoisted by means of a bucket to the top of the pocket, an ordinary hoisting engine furnishing the power. There is an opening in the side of the pocket near the base, for removing the coal in the ordinary way, so that it can be carried into the boiler room by means of an endless chain, with buckets, or by hand barrows, as may be preferred.

#### Miscellaneous.

—It is stated on semi-official authority that the Pennsylvania will adopt electricity as a motive power on the Springfield & Xenia branch of the Little Miami division, a distance of 22 miles.

—A contract for 300,000 ties has been let by the San Joaquin Valley Railroad Company to Crawford & Co. Vice president Watt states that the company had no present intention of connecting with any other road. It would cost \$5,000,000 to cross the Tehachapi, and the money could be expended to better advantage. As soon as the road was built down the San Joaquin Valley, he concluded, the company would proceed to extend the line from Stockton to San Francisco.

—The firm of Maher & Brayton has dissolved partnership, and the Cleveland Wheel Company has been formed to succeed to its business. Thomas Maher is elected president, and George Short general manager. The company will manufacture car wheels.

—The Bucyrus Steam Shovel & Dredge Co., of South Milwaukee, Wis., reports an increase in calls for steam shovels, cranes, dredges, etc., and has, among other orders now on hand, the following: Eight steam shovels, five for the iron ore district, two for railways, one for contracting work, a special steam traveling crane for the Illinois Steel Co., and a dipper dredge for the government to be used on the Arkansas river improvements.

—The South Pittsburg (Tenn.) Pipe Works has secured a contract for 1,050 tons of pipe at Greenville, Miss., where a water works system is to be put in. The two pumps, each of 1,000,000 gallons capacity, will be furnished by Henry R. Worthington, and the hydrants and valves by the Detrick Supply Co., of St. Louis.

—The East Shore Terminal Company's affairs, Charleston, S. C., are to be wound up under the direction of a receiver.

—The St. Louis Car Coupler Co., St. Louis, Mo., has filed suit in the northern district, state of New York, against the Trojan Car Coupler Co. for infringement of patent.

—The Manufacturers' Record states that one of the best built and equipped railway systems in the south, the Texas Midland Railway, will change its entire motive power from steam to electricity. The road is owned by Mrs. Hetty Green. E. H. R. Green is president, with headquarters at Terrell, Tex. The road is about 100 miles in length, and if the change is made will be the longest trolley line in the world.

—The Neafie & Levy Ship Building Co. are building a large freighter for the Menendez Co., of Havana, which is to trade between the United States and Cuban ports. She will be of steel, 250 ft. 8 in. long, 35 ft. beam and 20 ft. deep. She will be provided with twin screws and triple expansion engines. The vessel will be lighted by electricity and will be named "Reina de los Angeles."

—The Page Woven Wire Fence Co. of Adrian, Mich., has enlarged its plant in order to meet the demands made upon it. The company now operates 47 looms and turns out two miles of fence every hour. At present the company has in stock 270,000 square rods of manufactured fence and material to make more than an equal amount. The Page fence is now used on 100 railroads, and thirty-five additional roads have ordered samples. Among the recent orders received is one from the Midland & Southwestern Junction Railway of England, for ten miles, making a third order from that road, and one of twenty-two miles from the Maine Central Railroad.